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To develop a taxonomy of vocational-industrial education objectives which would provide a framework or structure for evaluating and comparing existing programs, and be useful in eventually establishing criteria for the design and development of a radically different comprehensive curriculum, a project was undertaken to apply a taxonomic scheme to the problems of vocational education curriculum, methods, and objectives. Educational objectives were classified in a 36 cell, three dimensional matrix according to Fine's functional job analysis scheme, used in the "Dictionary of Occupational Titles." As a result of a pilot effort, it was found that: (1) The background and training of the raters does not affect their ability to apply the taxonomy, (2) The taxonomy is equally applicable to any vocational course, and (3) The taxonomy provided a relatively concise framework for ordering almost 20 disparate objectives. The final phase of the research was designed to demonstrate that the taxonomy could be used profitably to describe, analyze, and compare the existing vocational-industrial education curricula of two high schools. Data collected by interview resulted in the conclusion that the taxonomy system can be of considerable value in preparing objectives and developing curriculums. Its usefulness in analyzing and evaluating current programs is limited. (DM)

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FINAL REPORT
Project No. 6-1659
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THE DESIGN AND EVALUATION OF VOCATIONAL TECHNICAL EDUCATION CURRICULA THROUGH FUNCTIONAL JOB ANALYSIS

August 1968

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HEALTH, EDUCATION, AND WELFARE

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The Design and Evaluation of Vocational Technical Education Curricula Through Functional Job Analysis

Project No. 6-1659
Grant No. OEG2-6-061659-2085

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George Washington University
Washington, D. C.

FOREWORD

The research reported here is an overall effort to develop a taxonomy for classifying vocational education objectives. The purpose of the taxonomy is to provide a framework or structure for evaluating and comparing existing programs. Several attempts to evaluate the taxonomy using data from existing educational institutions were undertaken.

The study was conducted by research staff members of The George Washington University. Director of Research was Dr. Howard H. McFann. The research was conducted by Dr. Kan Yagi, Dr. Hilton Bialek, Dr. John E. Taylor, and Mrs. Marcia Garman.

Special acknowledgements are due to Miss Annette Mahikoa and Mrs. Janice Glick for their assistance in typing and editing the report.

The research team would like to give special thanks to the administrators and faculty members of the participating schools for their cooperation and assistance. These schools were: Carmel Middle School, Carmel, California; Monterey High School, Monterey, California; and Seaside High School, Seaside, California.

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INTRODUCTION

Problem

A few years ago we were asked by some local public school districts to look into the vocational education program with the intention of evaluating its organization and effectiveness. We made some preliminary probes and discovered that no one seemed to know of a way that courses of different content, courses of the same content on introductory versus advanced levels, and identical courses in different schools could be compared, contrasted or evaluated. On this basis we decided to explore the educational and training research literature in search of some taxonomic or classificatory scheme which might be applicable to vocational and even non-vocational course analysis. The results of this exploration of the literature were reported in the initial proposal and are reproduced here in Appendix A. We concluded that a modification and extension of a scheme devised by S. J. Fine (1) might serve as the framework in which we could examine curricula. The problem we posed was whether such a scheme was feasible and, if so, whether it was applicable and useful in analyzing vocational education curricula.

Objectives

Our objective was to develop a taxonomy of vocational-industrial education objectives which would: (a) provide a framework or structure for evaluating and comparing existing programs; and (b) use the taxonomy to eventually establish criteria for the design and development of a radically different comprehensive curriculum.

In order to develop such a taxonomy, a departure from the conventional "research design" format was necessary. Technically, there were no hypotheses to be stated or tested other than the assumption that the products of this effort would realize the objectives stated above. In practice, however, there was a hypothesis operating; to wit, the problems of vocational education curriculum, methods, and objectives can be better understood and solved if a taxonomic scheme is applied.

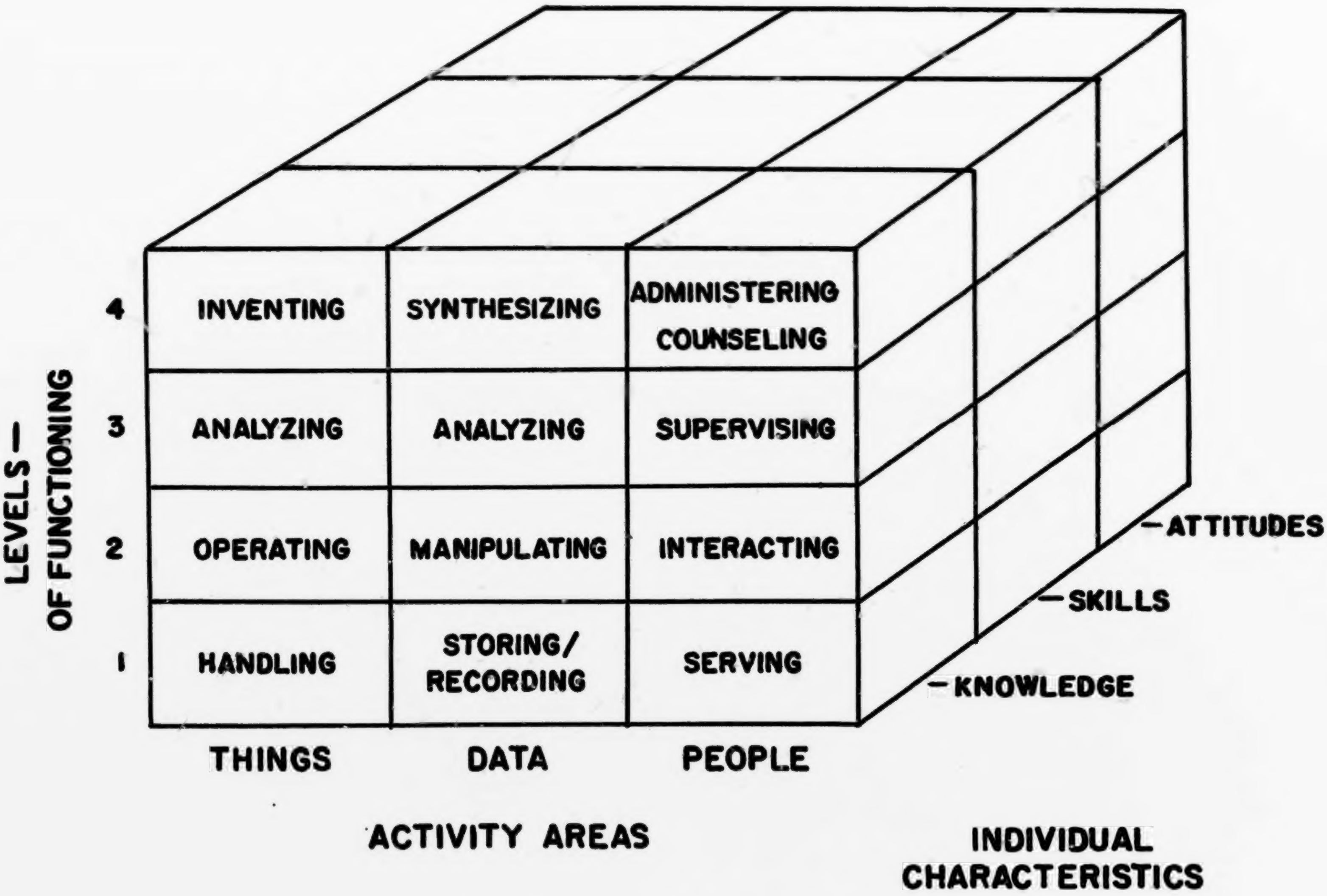
METHOD

Procedure and General Design

Starting with Fine's Functional Job Analysis scheme, used in the Dictionary of Occupational Titles (2), we sought to locate any specified educational objective in a three dimensional matrix. The general definitions of these three dimensions and the rubric we assigned to each was:

(1) The aspect of the environment with which a person is

FIGURE 1



LEVELS — OF FUNCTIONING	THINGS	DATA	PEOPLE
4	INVENTING	SYNTHESIZING	ADMINISTERING COUNSELING
3	ANALYZING	ANALYZING	SUPERVISING
2	OPERATING	MANIPULATING	INTERACTING
1	HANDLING	STORING/ RECORDING	SERVING

ACTIVITY AREAS
— ATTITUDES
— SKILLS
— KNOWLEDGE
INDIVIDUAL CHARACTERISTICS

THREE DIMENSIONAL REPRESENTATION OF TAXONOMY involved: ACTIVITY AREA (AA).

(2) What the person is "doing with" the given aspect of the environment: LEVEL OF FUNCTIONING (LF).

(3) The particular individual characteristics of the person required: INDIVIDUAL CHARACTERISTICS (IC).

The categories within each of the three major dimensions appear in Figure 1.

The detailed, specific definitions of each of these categories appear in Appendix B, but the descriptive terms appearing in Figure 1 are sufficiently self-explanatory for the purposes of narration. The initial assumptions underlying the construction of the matrix shown in Figure 1 were:

(1) The 4 x 3 x 3 (36) cells are exhaustive. Any objective, properly stated, could be assigned to one of the 36 cells.

(2) The Levels of Functioning within each Activity Area are hierarchical, the higher function assuming all those beneath it.

(3) Content or subject matter is to be ignored in attempting to analyze educational objectives.

In order to see more clearly what the Level of Functioning categories mean, we present Figure 2. Here, a list of synonyms under each major heading conveys the meaning more directly. These verbs also served as cues for classificatory activities later in the project.

Once we had evloved this basic scheme, our next step was to see if it had any direct utility in understanding or analyzing course offerings. As a sample, we used a list of courses which comprised a newly developing vocational curricula in a large city public school system (3). The curricula consisted of 14 different courses, including objectives for each of the courses. One member of the research staff classified each objective (a few could not be classified because of ambiguous wording); another classified a sample of the approximately 100 objectives for reliability purposes. The results of this exercise are shown in Table 1.

FIGURE 2

Breakdown of Levels of Functioning in Each Activity Area of the Taxonomy

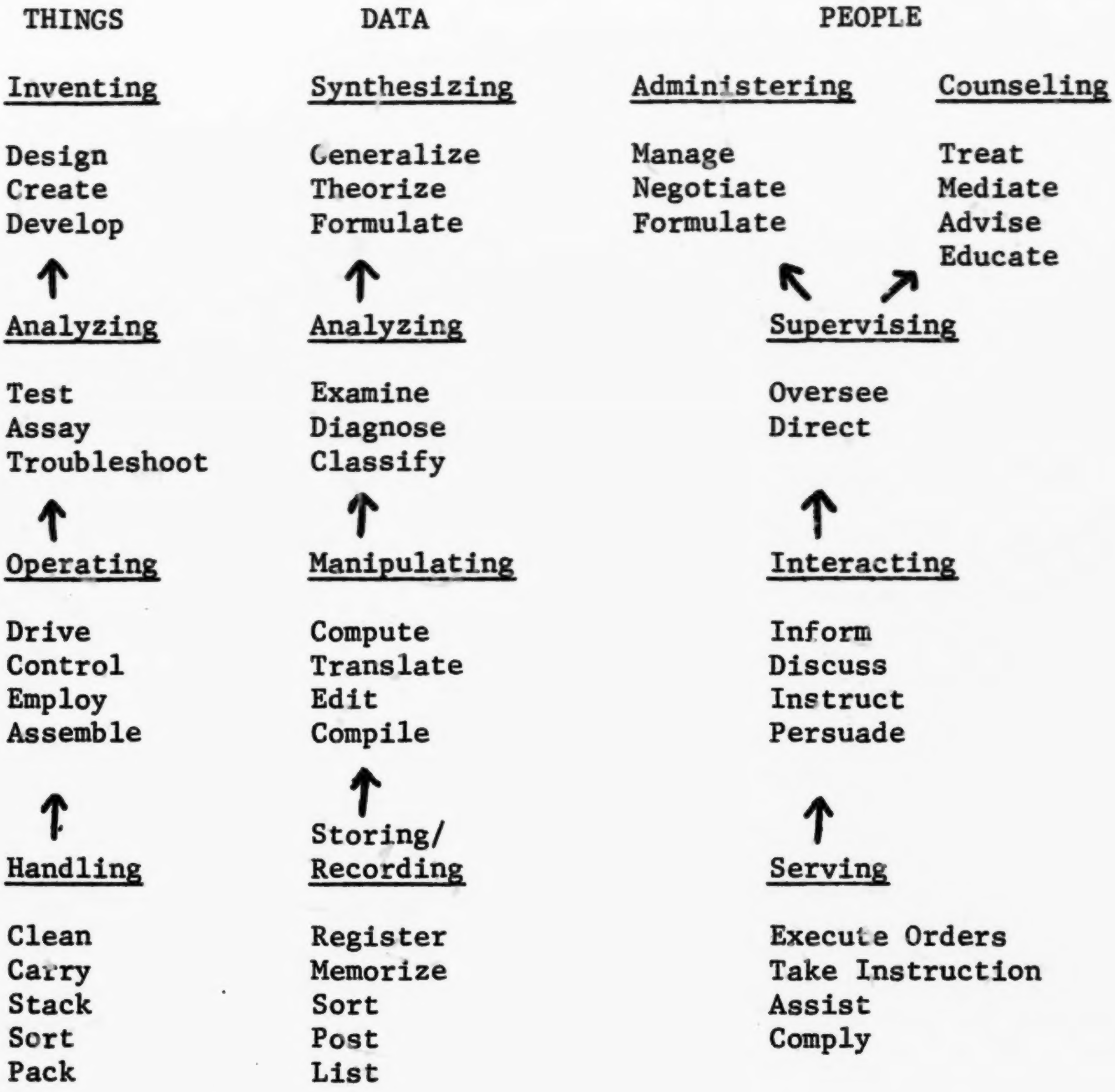

THINGS
DATA
PEOPLE
Inventing
Design
Create
Develop
Synthesizing
Generalize
Theorize
Formulate
Administering
Manage
Negotiate
Formulate
Counseling
Treat
Mediate
Advise
Educate
Analyzing
Test
Assay
Troubleshoot
Analyzing
Examine
Diagnose
Classify
Supervising
Oversee
Direct
Operating
Drive
Control
Employ
Assemble
Manipulating
Compute
Translate
Edit
Compile
Interacting
Inform
Discuss
Instruct
Persuade
Handling
Clean
Carry
Stack
Sort
Pack
Storing/
Recording
Register
Memorize
Sort
Post
List
Serving
Execute Orders
Take Instruction
Assist
Comply

TABLE 1

Categorization of objectives from a sample of vocational education courses in a public school system.

THINGS

	Handling	Operating	Analyzing	Inventing
Information	EM	ACCDEEFGGG HIK		
Skills	BD	BBBCDDEFFFFGGGG IIJJJKKKKKKKL		
Attitudes				

DATA

	Storing/ Recording	Manipulating	Analyzing	Synthesizing
Information	M	HIKMMM	HM	M
Skills	AAAABDD	AAAAABGK LLLLMNN	AHHHHLLNNNN	
Attitudes				

PEOPLE

	Serving	Interacting	Supervising	Administering/ Counseling
Information		CMM		
Skills	BBBN	DGL		
Attitudes		C		

Legend

A - Bookkeeping	H - Construction Technology
B - Stenography	I - Cabinetry
C - Clothing Merchandising	J - Maintenance Repair
D - Laundry-Pressing-Dry Cleaning	K - Plumbing
E - Industrial Sewing	L - Commercial Art
F - Brick Laying	M - Interior Design
G - Carpentry	N - Drafting and Design Technology

content areas of secondary school vocational education and, from these, composed a pool of objectives. In writing these objectives, technical terminology and jargon that might have been difficult to understand or that could have led to misunderstandings were avoided. Likewise, as much as possible, objectives that were vague and difficult to interpret were also avoided. On the other hand, the requirement that every objective be written so as to be precisely interpretable into one, and only one, taxonomic category was not strictly adhered to. The intention was to examine the nature of the "limits" that determined reliable categorization. The general frame of reference used in the writing was simply that the objective concern a reasonable educational objective stated in behavioral terms.

A final sample of 366 objectives (see Appendix D), an arbitrary total roughly equal to ten times the number of taxonomic categories, was chosen to cover seven broad educational content areas as follows: Mechinical (79)*, Business (43), Woodworking (47), Homemaking (33), Metalworking (40), Electronics (61), and Drafting (63). There was no attempt to write objectives to attain an equal distribution in all taxonomic categories, although objectives were written so that presumably some would fall in each taxonomic category. In general, distribution was guided by the literature showing a preponderance of objectives which appeared to fall in the lower LF categories of the Things dimension. In fact, the final distribution, based on the judges, showed that the general trend was for a larger number of objectives to fall into the lower LF categories. These decreased in number at the higher levels and decreased again in Things, Data and People, in that order.

Five teachers, certified faculty members from two local school districts, and two psychologists were chosen to judge the written objectives. Although the two psychologists were associated with this research project and had helped in the development of the taxonomy, they had no part in preparing the objectives. Of the five teachers, three taught industrial arts and vocational education courses and two taught academic courses.

All judges participated in a four-hour training session designed to familiarize them with the taxonomy and its use. They were also given written instructions (Appendix E) concerning the task to be performed and copies of the definitions of the taxonomic categories. Each judge worked independently, on his own time, and was allowed approximately three weeks to complete the assignment. Time requirements for teachers were liberal in order to avoid conflict with their official commitments.

A detailed analysis, complete with table and interpretations of this effort, appears in Appendix F. Here we present the major findings:

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* ( ) = number of objective statements for each content area.

(1) The background and training of the raters does not materially effect their ability to apply the taxonomy.

(2) The taxonomy is equally applicable to any vocational course regardless of content.

(3) The Activity Area dimension is the easiest to apply to the taxonomy, Individual Characteristics is next, and Levels of Functioning is the most difficult. Nevertheless, all dimensions were applicable at an acceptable level of accuracy.

(4) Certain verbs and terms used in the construction of educational objectives create problems in classification and should be avoided if possible.

(5) The taxonomy, in general, was usable, providing a relatively concise framework for ordering almost 400 disparate objectives.

DISCUSSION

Application of the Taxonomy

Our next step was an attempt to apply the taxonomy in the analysis of an ongoing vocational education program. We organized this effort around the following four questions:

(1) What is the overall pattern of objectives for a particular course, as indicated by the taxonomy? Does it reflect a progression or systematic change in the kinds of objectives over time?

To explore this we decided to periodically collect data over a school year. A 5-6 week interval was selected.

(2) According to the taxonomy, do courses offered in series show differences in their patterns of objectives?

We tried to select in our sample of courses, a number which extended beyond one offering. For example, Drafting, for which there were 4 offerings each requiring the previous ones as prerequisites. A list of the courses included, by school, appears in Table 2.

TABLE 2. Courses Surveyed at School A and School B

School A (Vocational Education)	School B (Industrial Arts)
BUSINESS EDUCATION	
Bookkeeping I	
Bookkeeping II	
Office Practice	
INDUSTRIAL EDUCATION	**INDUSTRIAL ARTS**
Auto Mechanics I	Auto Mechanics I
Auto Mechanics II	Auto Mechanics II
Drafting I	Drafting I
Drafting II	Drafting II
Drafting III	Drafting III
Drafting IV	Drafting IV
Electronics Drafting	
Electronics I	Electronics I
Electronics II	Electronics II
Trade and Technical Electronics	
Machine Shop I	
Machine Shop II	
Trade and Technical Machine Shop	
Woodwork I	
Woodwork II	
Construction Technology	

(3) Does the taxonomy indicate differences in the patterns of objectives of similar courses offered in different schools whose programs are identified as vocational education and industrial arts education?

We selected two High Schools from one unified school district. Presumably, the objectives of identically described courses in the same school district should be highly similar.

(4) Do the patterns of objectives, as indicated by the taxonomy, show differences between courses of different content?

We have consistently maintained that the content of vocational courses may not be the best or only dimension for defining differences and similarities. An analysis using the taxonomy would clarify this issue.

We were, however, still faced with the problem of the method by which we would actually obtain the objectives to be used in classification. Again we explored the range of possibilities: asking teachers to simply write them out, asking teachers to sort objectives into taxonomic categories, paper and pencil check lists, development of generalized objectives not dependent on specific course content, etc. The method we finally adopted, described below, seemed at the time the most promising in terms of obtaining usable, relevant and discriminable objectives. Whether or not we succeeded will be discussed in the conclusion section.

Interview and Purpose

To collect data on course objectives, we decided to use a structured interview form based on current course descriptions provided by the teachers. The interview form contained statements referring to the 36 taxonomic categories with the Levels of Functioning and Activity Areas in random order and the Individual Characteristics remaining constant. The purpose for this randomness was threefold: (1) to avoid giving the impression that categories were scaled; (2) to enable categories to be treated as independent elements; and, (3) to avoid anticipation of the next question by the teachers. A sample interview form is shown in Appendix G.

Information for developing the interview form was provided by the teacher's course descriptions, books, etc., which had been divided into convenient units of instruction of 6-8 weeks throughout the year. The purpose for using this information was to associate course content with the 36 taxonomic categories. Successive units were examined to chart progress in courses and to describe objectives for an entire course.

Individual interviews were scheduled during the teachers' 50 minute preparation period. Each course was surveyed three or four times. Explained at the outset was the purpose of the study, the general procedures to be followed, and the fact that this was not an evaluation of course content or teaching methods. The interviewer began by describing activities involving the dimensions of Activity Areas, Levels of Functioning, and Individual Characteristics. If the teacher indicated that such activities were conducted in the course under consideration, the interviewer probed further. The aim was to determine specifically the dimensions being developed through these activities.*

Problems Encountered in Data Collection

We encountered several methodological problems in collecting data from the teachers. These problems are quite interrelated but are listed separately for discussion purposes.

(1) Units of instruction.

Several teachers experienced difficulty in determining convenient units of instruction and the approximate completion date for each unit. They could not decide where to divide their courses, and some felt their courses could not be divided at all. Also they felt they could not give an approximate completion date for each unit because it was undependable. The problem was solved by dividing the teacher's course outlines ourselves and interviewing every six to eight weeks, whichever was most convenient to the teacher.

(2) Stating objectives for the past unit only.

We found it difficult to keep the teacher's attention focused on the objectives covered during the past unit and discovered many stated objectives relating to other units. We attempted to solve this problem by frequently stating, "During the past unit, was it an objective to . . .?"

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*During our initial interviews, we found a number of teachers to be apprehensive and slightly hostile towards the study. They felt we were there to evaluate their method and ability to teach. Despite our reassurances, it was exceedingly difficult to convince the teachers that this was not the case. Once we passed this barrier, however, they became very cooperative and interested in what we were trying to do. One teacher stated that the questions in our interview gave him ideas concerning supervisory activities, which he subsequently introduced into his classes. Another teacher stated that the questions made him realize that after teaching for a number of years, you lose sight of the formalized objectives you used to have in mind for your students.

(3) Vague and exaggerated objectives.

Many teachers lacked formalized objectives. As a result, their responses were vague such as, "I guess so" or "You could say that." No matter how much probing we did, it was difficult to get a "Yes" or "No" commitment. This was one problem that could not be resolved, and the vague responses had to be taken as an affirmative answer. On the other hand, we would receive slightly exaggerated responses if the teacher did not really know what his objectives were or if he tended to feel he did not have enough objectives for this particular unit of instruction. This situation was partially alleviated by asking for specific examples to see if they fitted into our taxonomic categories.

(4) Semantics.

One of our biggest problems was one of semantics. Although we tried to make our interview form as easy and simple as possible to understand, occasionally teachers did not agree with our choice of words and, as a result, could not answer our questions with a definite "Yes" or "No" response. To remedy the situation, it was necessary to rephrase sentences and define the terms more explicitly.

(5) Absence of formalized objectives.

Without formal, written objectives to serve as a reference or model, there was considerable disparity in interpretations by individual teachers. They seemed to view objectives quite idiosyncratically. For example, sometimes objectives were expressed in terms of the teacher's role so that statements such as, "to introduce the students . . .," or "to teach safety," were used. In other cases, activities in which students participated were described as objectives because "these are things they would be doing on the job." Apparently, hearing objectives stated in terms of relatively specific behavioral changes in students was a new experience for teachers, which probably accounts for the vague responses such as, "I guess students got that," or "you could say that was an objective," when questions were phrased in terms of student achievements.

(6) Individual Characteristic objectives.

Distinguishing between the three Individual Characteristics as separate objectives was another problem. Some teachers viewed the end product as their objective and also as an indication of whether or not the student had obtained one or all of the Individual Characteristics. For instance, a drawing would be viewed in the light of how well it was executed. If the drawing was good, the student must have acquired some kind of information, skill, and attitudinal change in order to produce the end result. Therefore, it was difficult for the teacher to distinguish and separate the Individual Characteristic from the end product itself. If the teachers felt all three Individual Characteristics were reflected in this product, we accepted their answers as affirmative responses.

Despite the problems and pitfalls encountered in collecting data via the interview, it had its advantages. In conducting the interview we could repeat or rephrase our questions to achieve sufficient clarity. Conversely, the interview allowed us to seek clarification of the teachers' responses. Another advantage was that in a person to person relationship, apparent contradictions and omissions could be quickly verified.

Still another advantage in favor of the interview was that it could be conducted effectively without taking too much of the teacher's time. It involved only talking, and responses were quickly recorded. It was much easier to describe objectives orally than to put them in writing.

Finally, the interview form served as a reference guide for the interviewer to follow, although the exact wording and order was not always adhered to depending upon the situation. Since teachers had to conceive their objectives "on the spot," so to speak, we felt that a guide was necessary to avoid missing objectives, especially those related to attitude and personality development.

RESULTS

The data collected from teachers over the year was tabulated and recorded in terms of a profile of the objectives selected at each interview. The results of the data are interpreted in terms of the kinds of information that the taxonomy could provide about current vocational-technical education curricula. For the purpose of simplification, we have presented the results in terms of the four questions raised earlier concerning the patterns of educational objectives of courses.

(1) What is the overall pattern of objectives for a particular course, as indicated by the taxonomy? Does it reflect a progression or systematic change in the kinds of objectives over time?

To answer this question, it is necessary to examine the differences and patterns discernable among the three or four interview sessions. To the reader interested in any specific course in a curriculum, Tables 1 through 9 in Appendix H will provide the detailed information. In this section we will discuss general trends.

Of the 26 specific courses analyzed, 8 revealed some systematic pattern over time for one or more of the taxonomic Activity Areas. A clear example of this is seen in the Bookkeeping II course in the "People" area (Table 3, Appendix H); early in the semester the objectives focused on "serving" and "interacting." As the term progressed, the emphasis shifted more toward "interacting" and "supervising." Another example (Table 4, Appendix H) is the observable progression of objectives in the "Thing" area for Drafting I courses at School A. The early objectives stressed "handling" and "operating." Over time the emphasis shifted to "analyzing" and "inventing."

The prevelant observation, however, is the lack of any systematic change (or the lack of any change for that matter) over time. Except for the eight specific instances just cited, instructors did not perceive earlier units of instruction within a given course as possessing any different objectives than later ones in the course.

(2) According to the taxonomy, do courses offered in series show differences in their patterns of objectives?

Five different series of courses were analyzed. One would expect that as courses became more advanced, certain objectives would tend to drop out and be replaced by others. The latter would represent either more complex processes or different activities. In general, such was not the case. There is no clear pattern of objective replacement or displacement. According to our analyses of the instructor's definition of their objectives, more or less the same objectives are applied to each new content area of instruction. In an introductory auto course, for example, a unit of instruction in exhause systems may have as its objective the "handling" and "operating" of Things involving "Information" and "Skill" on the part of the student. A year later, the unit of instruction on carburetion will require the identical objectives. This phenomena was the most prevalent characteristic of the analysis of courses offered in series.

(3) Does the taxonomy indicate differences in the patterns of objectives of similar courses offered in different schools whose programs are identified as vocational education and industrial arts education?

There were three sequences of courses offered at both School A and School B: Auto Shop, Electronics, and Drafting. Each pair will be discussed separately.

Auto Shop. An interesting contrast (see Tables 1 and 2, Appendix H) in the introductory Auto Shop course, is the greater emphasis placed upon supervisory functions in the People activity area at School B; the greater emphasis is placed upon "analysis" in the Data activity area at School A. This distinction does not appear in the second Auto Shop course; in both schools there is equal emphasis placed upon virtually all the possible objectives in the taxonomy.

Electronics. Differences between the two schools appear both in the introductory and second electronic courses. The School A course is pitched higher in terms of Data activities; the highest objective there is "analyzing." In School B it is "manipulating." In addition, School A is also more concerned with supervisory functions in the People area, in contrast to School B which limits its objectives in the People area to "interacting."

Drafting. In this sequence of courses, School B Drafting programs tend to pose "higher" objectives for its students than does the program at School A. This is especially true at the more advanced levels and it occurs mostly in the "Things" activity area. Both schools propose "handling" and "operating" at all levels, but School B adds "analyzing" and "inventing" at the more advanced levels of the Drafting sequence. School B, as in their Auto Shop sequence, tends also to place greater emphasis on supervisory functions in the People activity area.

(4) Do the patterns of objectives, as indicated by the taxonomy, show differences between courses of different content?

The answer to this question is clearly "no." In fact, the overall picture is one of undifferentiation. It is a case of overstating desired objectives. As implied throughout this section, the problem is not a lack of stated objectives, but the fact that teachers tend to assign (or overassign in our estimation) too many objectives to the target unit of instruction. The methodological problem involved here has been discussed in the previous section, but they so tend to influence a detailed analysis and discussion of the findings as to make them secondary. Given these limitations, all one can say as an overall generalization is that the vocational curriculum, as represented by our sample of courses, tends to include a wide sample of the 36 possible taxonomic objectives. As would be expected, the higher Levels of Functioning do not appear as frequently, but all Activity Areas and all Individual Characteristics are well represented.

Implicit throughout the foregoing analysis has been a certain model of curriculum process based on our taxonomic system. Briefly, it argues that units of instruction within a course, sequence of courses, and courses described as being similar, should be based upon a systematic structure of objectives; Levels of Functioning in each Activity Area should first appear at the less complex level and progress to the more complex within each Activity Area. Activity Areas should be more or less prevelant depending on the overall course objective, but should be equally weighted when a student's entire curricula is analyzed. Individual Characteristics should be differentially emphasized. Longitudinally, one should see a cyclical pattern of objectives. This curriculum process model was the basis for "looking for patterns" described above. To say that our initial investigation failed to substantiate the model is being redundant. Part of the failure is undoubtedly attributable to the methodological problem of obtaining a true picture of what the objectives actually are (if indeed there are any!). We still believe the taxonomy to have great potential value in analyzing, comparing, and designing vocational education curricula.

IMPLICATIONS

The purpose of this research was to develop a system for classifying vocational-industrial education objectives that could be used not only to develop new curricula, but to descirbe, analyze, and compare existing programs. After a tentative system was developed, a reliability test was given to a panel of judges (five teachers and two research psychologists) who were trained in the use of the taxonomy. After making some minor adjustments in the system, it was applied to the study of existing vocational-industrial education programs. Although the system was designed for application to vocational education, it is hoped that it will have broader application in the educational domain, and to the full range of age-grade levels.

Literature demonstrating the value and use of various classification schemes in the development of educational materials is being produced rapidly. However, we were unable to find a single study demonstrating the use of these systems in analyzing existing school curricula. Perhaps it is better to develop new programs based upon more elaborate, conceptually sound systems than to study old ones. We proceeded with the study under the assumption that educational programs will only be changed if they are carefully evaluated, and proof of their strengths and limitations is presented.

The evaluation of any educational system*, in its entirety or in parts, begins with a study of the objectives. We have demonstrated in this study that it is possible to get some indication of what these objectives are, and how the taxonomy can be used to display them. If the objectives are deemed appropriate, desirable, and within the realm of achievement, it would seem that the educational system could be evaluated in terms of the accomplishment of these objectives. One of the immediate uses of the taxonomy, then, is to present and display the curricula, via its objectives, in order to determine their appropriateness, adequacy, and obtainability for the students. Objectives finally selected should be measurable, and at least a significant portion of the students should be able to achieve them. Otherwise, there would be no point in listing them. An example of how the taxonomy can be used in the study of an educational curricula will be helpful.

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*An educational system is assumed to consist of four interrelated parts: curriculum, facilities, teachers, and students. The taxonomy is directed toward study of the curriculum aspect primarily.

Suppose that lists of objectives for units of study or courses have been prepared. In a science course one of the objectives is, "the student should be able to set up a microscope and its attachments efficiently to clearly present and focus several varieties of specimen for examination." Evaluation of this objective can proceed because we know precisely what is expected of the student, i.e., he is to demonstrate an acceptable level of proficiency (Skill) in using (Operating) a microscope (Thing). He is not expected to pass a written test on the microscope, nor is he expected to demonstrate that he enjoys using the microscope. He is expected only to set up the microscope and bring several specimen into sharp focus.

In order to achieve an acceptable level of Skill, one would expect that: (1) microscopes, or other optics, and materials for practice and demonstrating achievement, be available in the school system; (2) the students be physically and mentally capable of achieving the objective in a reasonable time; and (3) adequate instructions be given in the appropriate manner. The failure to achieve this objective could be attributed to any or all of the above prerequisites.

Since we are able to determine the exact taxonomic classification of this objective, we can examine it in relation to others in the course and even to objectives in other courses. The order of the objectives should be examined in order to determine the proper sequencing of learning experiences. The sequence might be in terms of course or in terms of units of study. By examining the array of objectives, it is possible to evaluate them in terms of depth and breadth of coverage. Undesirable concentrations and voids can then be avoided.

During the interview sessions, the teachers themselves pointed out some immediate uses of the taxonomy with regard to teaching and arrangements for learning. One teacher explained that he found the taxonomy to be a source of ideas for choosing and arranging learning experiences for the students. He became aware of what he expected students to obtain from these experiences. Another teacher arranged for a "shop foreman," and thought of other activities which would involve the students in objectives dealing with people. He stated that he deliberately arranged many interactions among students to cultivate interpersonal relations skills. Other teachers expressed problems in evaluating the performances of students. Performances in terms of behavioral acts with regard to the taxonomic categories were seen as a helpful approach.

Finally, introspections and comments by a teacher were especially provocative. Following an interview, he commented that this "makes you wonder about what you are trying to accomplish in teaching." He was struck by teachers placing so much emphasis on what students were expected to produce, such as turning out a high quality product or accomplishing a particular task with instruments and equipment obviously designed to accomplish a variety of things. He admitted, and felt other teachers did too, that he frequently got "carried away" with producing a good product, and ignored the more general purpose of his teaching. Submitting someone else's work as their own is not an uncommon practice among some students who find that grades are frequently based on the quality of their products alone.

Effective use of the taxonomy requires, first, that objectives be thought of in terms of functions, not content, and that they be expressed in terms of behaviors in dealing with the environment. An appropriately stated objective implies the three dimensions of the taxonomy, and is classifiable in one, and only one, taxonomic category. Recent literature on the preparation of objectives (Mager (4), Ammerman and Melching (5), and Bloom (6)) has drawn attention to the need to present them in the proper terms. We feel that the taxonomy can be an aid in this task by providing the necessary framework.

Secondly, the most effective use of the taxonomy depends on an efficient weighting system. The taxonomy provides a practical way of displaying the spread of objectives; but, other than the number of objectives within a taxonomic category, we find no efficient means of indicating depth, weight, or relative importance. Perhaps it isn't necessary for a classification system to become involved in depth. However, without this dimension the system's usefulness is limited in that it doesn't give enough information. For example, the taxonomy might show that a certain objective is covered in a course. It would not show that 40% of a student's time would be consumed in achieving this objective due to its importance. The advantage of this taxonomy, then, is that it provides specific dimensions and categories on which to determine a weighting system.

Finally, without measures or other indications of achievement of the objectives, the classification of objectives, or even the specification of them, is meaningless. by the same token, adequate measurement is difficult, if not impossible, without some way of identifying and defining the behavioral phenomena to be measured. The taxonomy can be a tremendous aid to the delineation and identification of behaviors to be measured. Perhaps an illustration of how the taxonomy might be used to analyze objectives and determine areas of measurement will be helpful.

Teachers frequently implied that, although objectives from two units or courses could appear quite similar, one requires more skill and greater precision: one objective was more difficult, more complex, or just plain harder. The problem is to determine the bases for these differences. For example, an objective for two courses might be, "the student demonstrates skill in operating the typewriter." Does one simply impose a higher criteria of performance (20 wpm vs. 60 wpm) so that practice is the only significant factor? Or, does one involve a greater number of elements or more objectives (straight typing vs. typing letters, forms, and tables according to a prescribed format)? Or, does one objective actually consist of several cutting across two or more taxonomic categories (straight typing vs. determining spacing and format in addition to typing them)? The taxonomy, then, provides a means of delineating and identifying factors for measurement.

SUMMARY

The rationale and need for a comprehensive educational curriculum, which gives the development of perceptual-psychomotor skills the same status and emphasis as the mental and moral aspects of education, was recognized. The more immediate goal, and the goal of this research, was to develop a taxonomy of vocational-industrial education objectives which can be used not only to design new curricula, but to describe, analyze, compare, and evaluate new and existing ones.

The taxonomy of educational objectives is outlined in the form of a matrix of: (1) three Activity Areas, (2) four Levels of Functioning, and (3) three categories of Individual Characteristics. The Activity Areas, which are adopted from Fine's Functional Job Analysis used in the Dictionary of Occupational Titles (2), concerns what individuals are dealing with in their learning experience. All learning activities are assumed to be carried out in relation to things, data and people. "Things" refers to all physical or tangible objects other than humans, or animals dealt with as humans. "Data" refers to ideas, concepts, information, and other intangible phenomena which are usually in the form of numbers, words, or symbols. "People" refers to total human beings or animals being treated as humans.

The Levels of Functioning concern what individuals do with the things, data, or people. Four Levels of Functioning, presumably hierarchical, are identified and defined for each Activity Area. Hierarchical means that increasingly greater degrees of competence across a wider variety of content is required to function at each higher level. The levels as they are defined are unique to each Activity Area so that a total of 12 Levels of Functioning (3 Activity Areas x 4 Levels of Functioning) are needed.

Individual Characteristics are concerned with what individuals acquire as a result of their learning experiences. These characteristics, which appear quite frequently, in one form or another, in educational literature, are identified here as Information, Skills, and Attitudes. In general, Information is factual material or content that is provided for the individual through various forms of classroom communication. Skills are of two general types, cognitive and motor, and concern those abilities that are developed through practice. Attitudes are acquired predispositions toward things, data, or people, and to a large extent are the bases for inferring personality characteristics. This 3 x 4 x 3 matrix forms a 36 category classification system.

The taxonomy was first used with objectives from an existing vocational-technical education program to determine the adequacy of the system and the kinds of information it could provide. Encouragingly, it provided a concise, revealing profile of the program which showed instructional objective emphases, concentrations, and voids.

The next step was to determine the reliability of the definitions of the terms and concepts used in the taxonomy through interjudge agreement in the categorization of a large sample of prepared objectives. The results indicated that teachers, with only a few hours of instruction with the system, generally agreed with the researchers who helped to develop the taxonomy. Disagreements in categorizations were largely attributed to the way objectives were stated.

The final phase of the research was designed to demonstrate that the taxonomy could be used profitably to describe, analyze and compare the existing vocational-industrial education curricula of two high schools. Specially prepared, structured interview forms were used to collect data via periodic interviews. The problems encountered in collecting data were described. These data are presented and analyzed in terms of the kinds of information that the taxonomy can provide.

It is concluded that, although we continue to feel that the system can be of considerable value in preparing objectives and developing curricula, its usefulness in analyzing and evaluating current programs is limited by the state of the art in perceiving and stating educational objectives.

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APPENDIX A

1. Problem

There is little doubt that most current vocational education programs in the trade and technical areas in public high schools are perceived as being of inferior status, as being based on specific occupations which may be or soon become outmoded, and which are rarely based on any concept of perceptual-psychomotor skill development. A proposed reorganization of curriculum which includes this domain early in the education process and which makes no clear preferential distinction between conceptual development and perceptual-psychomotor might significantly change the attitude toward and motivation for "non-academic" education. This need is visible in both the current products and the current programs of vocational education. A new start must be made in which vocational education, per se, is not separated from the comprehensive curriculum. In its place must be a K-12 program which places equal emphasis on the conceptual, affective, and perceptual-psychomotor domains.

The long range purpose is to develop a comprehensive curriculum based on specified educational objectives which would give to the perceptual-psychomotor aspects of behavior the same status and emphasis as is assigned to the cognitive and affective domains. The more immediate goal is to derive a taxonomy of perceptual-psychomotor skills and knowledge objectives from which a rational curriculum can be designed for education in this domain. The first step toward achieving this goal, and the purpose of this specific proposal, is an empirical application of an initial classificatory scheme in an actual educational setting.

2. Related Research and Background Information

(a) Rationale: There is an unmistakable trend, now that the academic disciplines have become actively engaged in the study of education, toward the development of measurable criteria and definable objectives of educational programs, curricula, and specific lessons units. Especially in those areas which lend themselves most easily to quantification has progress been noted. The Science Curriculum Improvement Study (SCIS), the Elementary Science Study Project (ESSP), the now familiar SMSG, and the Madison Project, to cite some of the more prominent projects, are all characterized by a careful specification of the measurable behaviors that are to be, hopefully, elicited from the learner. There are now signs that this approach to curriculum design is moving into the less quantifiable areas exemplified by the University of Illinois Social Science Curriculum Study in which the curriculum is based on the inductive approach with an emphasis on logical development of content and compatibility with children's cognitive development. These are exciting programs and the general movement cannot help hasten the time when curricula are based on empirically determined patterns of growth and development in the cognitive domain.

Similarly, most public schools are continuously trying to develop better programs aimed at the affective growth of the child. Although "progressive education" as a public doctrine is dead, the child-centered approach flourishes and will undoubtedly continue to do so. This philosophy which has permeated educational thought stresses the role the school should play in the development of the child's social and personal needs, his feelings, his values, his judgments, his ability to cope with life, or simply -- the affective domain. Even a casual examination of the educational research literature and curriculum texts will reflect the emphasis still being placed on education in the affective domain.

Bloom and his associates (6),(7) have put forth their now famous taxonomy based on an educational objective having three basic domains: the cognitive, the affective, and the psychomotor. Psychomotor is used here as a general term to refer to manipulative, motor-skill types of activities. In contrast to cognitive and affective, this domain places primary emphasis upon a person's actual commerce with the objects, information, and people in his environment as they relate to the accomplishment of a job or a task -- the "world of work."

Essentially, the arguments for a taxonomy are that it provides a common language for communication amongst the educationalists, provides for the precise definitions of terms, and is based on a logical ordering. It has, however, become much more than that because it provides the schools with a way to (a) evaluate what they are doing, and (b) potentially organize the curriculum in some systematic fashion, based on the taxonomic hierarchy itself. As of this date, a taxonomy of the cognitive and the affective domains has been published. What about the third domain? Bloom, in referring to the psychomotor domain, says, "although we recognize the existence of this domain, we find so little done about it in secondary schools or colleges that we do not believe the development of a classification of these objectives would be very useful at present." (p. 7-8)

Since that statement was made, the failure to consider this domain as a vital part of educational objectives has not been appreciably rectified. The emphasis, therefore, on the cognitive and affective domains (as summarized above) at the expense of the psychomotor accounts, in part in our opinion, for the large percentage of young people who leave or "drop out" because of dissatisfaction with school. The relationship between the failure of schools to recognize and legitimatize the psychomotor domain and the "dropout" problem is best summed up in the statement made in the Report of the Panel of Consultants on Vocational Education to the President of the United States (9). The Panel stated, "many of them (dropouts) feel that, in view of the academic nature of the school program and the hierarchy of teachers' marks, they are failures and do not belong in school. Their interests and aptitudes may be different and more related to the motor skills and practical aspects of learning. It is probable that in this context many of them may be gifted or talented if this classification can be defined in psychomotor learning. Usually the intelligence they display is nonverbal; their strength is not in the symbolic and the abstract, although they seem to be able to sometimes master the deficiency through strong interest and motivation, occasional success and recognition, and realistic application. School, many of them conclude, is a waste of time." (p. 126) In a survey of 17 studies investigating reasons given for dropping out of school (9), it was found that economic need or necessity was a minor factor; most students leave simply because school is uninteresting, meaningless, dissatisfying. They do not perceive any functional relationship between their school experience and the rest of their life.

To counter the problem, public schools in America historically have taken the pragmatic path of offering vocational training courses at the high school level or, at least, a program of vocational counseling and information. The majority of in-school vocational education programs "generally require that half the student's school day be devoted to shop, laboratory, and technical instruction directly related to the occupation area for which he is enrolled; e.g., carpentry, food-trades, printing, dressmaking, and other courses. The balance of the school day is devoted to the study of required or other elective subjects of a general nature; e.g., English, history . . . and other subjects." (8, p. 33) The basis on which a vocational course is originally added to the curriculum is not clear. Whether a particular school selects carpentry, another electronics, and another body repair is probably a joint function of finances and local industrial needs. The young man entering such a program is generally forced to select from at most three occupations and hopefully finds them commensurate with his interest and aptitudes. Added to this is the conservative estimate that half the children now in school will be subsequently employed in jobs that do not now exist.

But of greater significance than the forced limitation on choice is the process whereby a young man enters the typical high school vocational program. In the overwhelming majority of cases, assignment to or choice of such a program is a consequence of less than adequate performance in the cognitive-affective domains; the choice or assignment is clearly perceived by the student and the school system as a sign of failure or inadequacy. No amount of well-equipped shops can offset the built-in inferior status of psychomotor learning in the contemporary public schools. Thanks to the impetus provided by the Federal government, innumerable programs have been initiated to combat the "dropout" program. (See the Educational Research Service Circular #1, 1965 (10) for a review of some 44 programs aimed at the "disadvantaged.") It is safe to make the generalization that programs designed to combat the dropout problem are stop-gap short range projects designed to keep the student in school and hopefully pick up some entry skills in some specific occupation. The immediate need for such programs is undeniable and the efforts are, by and large, commendable but these projects will not, by themselves, solve the problem of how to prevent so many young people from reaching high school age with such negative attitudes toward school and themselves as "learners." The point of contention in this proposal is that the very hierarchy of values the schools themselves place upon the education domains -- cognitive, affective, and psychomotor, creates a built-in handicap for the student whose strengths lie in the psychmotor area and that any vocational program initiated at the high school level without a planned psychomotor curriculum having preceded it from the elementary grade onward can only be, at best, stop-gap.

The argument for a comprehensive curriculum which incorporates psychomotor objectives is strengthened by the theoretical writings and research findings of Super and his collaborators (11). Although they do not concern themselves specifically with educational objectives and curriculum, the core idea in their theory of vocational behavior is the self-concept; an individual's vocational preferences and his career patterns are best understood as his attempts to implement his self-concept. Undoubtedly, in the development of a self-concept, school experiences play a significant role. As has been observed many times and implied previously above, a goodly proportion of children, on the basis of their school experiences, come to regard themselves, as Dexter (12) bluntly puts it, as "stupid." Specifically, they get to believe that in the achievement area (which the society stresses so mightily) they are failures. Consequently, vocational aspirations are either repressed or twisted into fantasized expressions. Again, if a curriculum is designed which recognizes the existence of psychomotor development and achievement as worthwhile, it is quite conceivable that some of the negative attitudes toward self as well as towards school might be modified.

As an alternative to the establishment of specific vocational programs at the high school level, it would be ideal if a student from the time he enters the public school came to see that skill, interest, and aptitude for non-academic or non-cognitive activities are as acceptable and institutionally supported as are the academic performances and, more significantly, that the curriculum was designed to include, along with cognitive and affective objectives, psychomotor ones as well. Hypothetically, it would be as logical and as usual for a student as he moved up in the educational system to veer towards this area as it is for others to move toward the more purely cognitive. This implies that all students initially proceed through the tripartite (cognitive, affective, psychomotor) curriculum and not that students be assigned to one or the other. To illustrate, the ideal situation would be when teachers and students alike are no more conscious of the fact that the curriculum includes cognitive and psychomotor activities of equal status than they are now that both English and mathematics are taught to everyone on a basis of equal importance.

The arguments presented above can be summarized by the proposal that a fresh approach needs to be taken to the old problem of the relationship between vocational preparation (training, education) and intellectual training. The approach proposed here rests on the basic assumption that the development and education of the class of skills and knowledge identified by the term psychomotor is a legitimate responsibility of public education for all pupils from the time they enter the system in the same degree and with the same emphasis with which the public schools assume responsibility for education in the cognitive and affective domains. In order to develop such a comprehensive curriculum, a taxonomy, or at least a system which includes a classification of psychomotor skills and knowledge needed to be developed.

The final rationale for the development of a taxonomy of the psychomotor domain stems from some recent efforts of a local group made to evaluate some of the ongoing vocational programs in the immediate area. We discovered the impossibility of the task because there was no available statement of objectives or a list of criteria which would allow us to evaluate, even informally, the effectiveness of the programs. Statistics such as the number of students finding employment or the number enrolling in junior college or technical programs are notoriously unreliable and in many respects misleading criteria. As a result, the felt necessity for the development of a taxonomy in its own right which would culminate, ideally, in a statement of objectives in measurable terms, has become all the stronger. The opportunity would then exist to compare various programs as well as to evaluate individual ones.

(b) Developing Taxonomies: There are innumerable bases on which a taxonomy can be constructed, but Bloom's criterion seems as appropriate as any. "What we are classifying is the intended behavior of students -- the ways in which the individuals are to act, think, or feel as the result of participating in some unit of instruction ... It is recognized that the actual behaviors of the students after they have completed the unit of instruction may differ in degree as well as in kind from the intended behavior specified by the objectives." (6, p. 12) Of course, it must be understood that "intended behaviors" must be invented -- that is, it is society which must decide what behaviors education, at any given level, should ideally elicit.

Although Bloom's basic criterion is appropriate, a brief mention of other efforts to develop classificatory schemes for behavior will provide an additional perspective. Except for Bloom and his collaborators, practically all taxonomic efforts have been conducted either in relationship to the military-industry systems and training research movement, or to the classical laboratory learning experiment. The former efforts have grown out of the applied problems of efficiently designing large man-machine systems and of efficient training of the large number of people needed within the systems. The latter have sprung from the admitted failure of "learning" research in general to provide useful generalizations because there is no system relating one laboratory situation or task to another. Excellent discussions and descriptions of the problems of training research in general and the role of and need for classificatory schemes in particular can be found in Glaser (13), Gagne' (14), and Haggard (15), Stolurow (16), and Folley (17). Without delving into the particulars of the handful of schemes which have been developed* in this area, they can be summarized for present purposes by stating that, in general, they were found inappropriate for purposes of classifying educational objectives because of their restrictiveness or narrowness. For example, the literature on "job analysis" is filled with innumerable classifications of requirements, elements, tools, functions, etc. for a large variety of jobs, but the classification in every case is based on an existing job or man-machine system in contrast to the type of scheme sought for in this research which, rather than being dependent upon or derived from existing jobs, should result in an evaluation and categorization of that job itself into a larger scheme. The inappropriateness of "borrowing" the schemes that have been developed for classifying laboratory learning situations is due primarily, on the other hand, to their being too conceptual or broad. Cotterman (18), for example, presents a list of task characteristics under three major headings: stimulus, response, and invariance. His objective was to derive a classificatory system for all laboratory situations and for even this markedly reduced class of situations he proposes 389 kinds of laboratory tasks. Assigning a job or an occupation to one or a combination of these major headings or to Cotterman's stimulus, response, invariance scheme overcomes the restrictiveness of the job-analysis approach but is, unfortuantely, so broad as to have questionable utility.

Gagne' (14) has presented a compromise in suggesting that categorizing human functioning into sensing, identifying, and interpreting -- "information-processing functions" in relation to man-machine systems exclusively will be beneficial to the design and analysis of systems. This approach fits in more closely with the objectives of this proposed research but it is felt that the threefold classification is too broad and somewhat restricted to man-machine systems.

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*Taxonomies have a particular penchant for "getting lost" after the initial developmental stages. It is very hard to find one which has actually been put to use and remains in use.

A quite different approach has been taken by Fine (19) in attempting to systematize the Dictionary of Occupational Titles (2). His approach was based on behaviors or functions actually performed and included a treatment of the psychomotor domain. Because Fine's system seemed particularly relevant to the development of behavioral objectives in vocational education, we relied upon it heavily in the development of our taxonomy (presented in Appendix B).

In summarizing, there has been an insistent plea for taxonomic activity in the behavioral sciences. Melton (20) in 1959 complained:

> "This brings us to a difficulty that must be faced. I refer to the lack, in behavioral science in general and in human psychology in particular, or what may be called a taxonomy of tasks. I shall not dwell on this beyond a statement of what I mean by it, and what it means for the integration of psychology and education, because it is a topic far beyond the scope of this paper -- and furthermore, because I can see the problem but I cannot see the solution for it! My statement means that psychology does not have a satisfactory classification scheme in terms of which specific tasks engaged in by human beings can be described, identified, and placed in a dimensional matrix in relation to other tasks. Without this taxonomy we are forced to use such crude descriptive categories as we referred to previously -- discrimination learning, selective learning, tracking, concept formation, paired-associate learning -- with the implication that we believe in a typology of learning, when, in fact, most of us do not, and when, in fact, it is known that all instances within these classes are not functionally equivalent." (p. 101)

Those who have taken heed of Melton's complaint have, unfortunately, tended to follow his lead and concentrate upon laboratory type tasks. What is needed is a greater effort on examining and classifying educational tasks and objectives much in the manner that Bloom and his associates have done for the cognitive and affective domains so as to include the psychomotor. This should be followed by extensive empirical investigations designed to make initial classificatory schemes truly taxonomic. As alluded to above, there is practically no evidence, in any of the schemes proposed, of follow-up research designed to test and strengthen the system.

3. Objectives

To develop a taxonomy of vocational-industrial education objectives which will: (a) provide a framework or structure for evaluating and comparing existing programs, and (b) establish criteria for the design and development of a radically different comprehensive curriculum.

In order to develop such a taxonomy, a departure from the conventional "research design" format will be necessary. Technically, there are no hypotheses to be stated or tested other than the assumption that the products of this effort will realize the objectives stated above. In practice, however, there is a hypothesis operating; to wit, the problems of vocational education curriculum, methods, and objectives can be better understood and solved if a taxonomic scheme is applied.

APPENDIX B

A Description of the Taxonomy

Basically, the system is designed to classify an educational objective along three independent dimensions (Figure 1). These three dimensions, (Activity Areas, Levels of Functioning, and Individual Characteristics), reflect three fundamental questions one asks about human performance:

(1) With what aspect of the environment is the person involved?

(2) What is he doing with this aspect of the environment?

(3) What individual characteristics are focused on at that moment?

Traditionally, the general purpose of education has been expressed as the development of knowledge, skills, abilities, and attitudes -- centered on individual characteristics. By continuing to apply such general terms to the objectives of school curricula without specific references, we tend to overlook much of the "real world" that characterizes learning and the activities of people. Adding the needed references permits us to "fix" and define any objective simultaneously along three logical and comprehensive dimensions. A detailed definition and explanation of each dimension of the taxonomy as it was developed follows.

Activity Area

The categories of Things, Data, and People proposed by Fine (19), and which also appears in the Dictionary of Occupational Titles (2), seem to comprehensively cover the universe of environmental elements that an individual can deal with quite adequately. These three categories form one dimension of the taxonomy, comprising what we have called Activity Areas (AA).

Most human encounters with the environment involve Things, Data, and People simultaneously and with constantly varying degrees of relative emphasis. For the purpose of classifying any given educational objective, however, we are assuming that one, and only one, element of the environment is the goal or focus of attention at that moment. This will be made clearer as we define each category.

(1) Things. By "Things" we mean that some physical or tangible object is being dealt with and the object, per se, occupies the center of attention. This excludes the notion of living humans or animals being treated as total living beings but does include them or their parts as Things if they are treated merely as physical objects. The object may consist of parts, in which case even the

separate parts may be considered as Things. For example, we may consider cars, bridges, and cups as Things, or we may consider only the tires, beams, or handles as Things.

Things may be present physically, involved abstractly, or represented in pictorial form, so that the activity may involve actually driving a car, a discussion about removing or replacing parts, or the design of a car. What is important is that a concrete, or potentially concrete object occupies the center of attention. If we were concerned with such concepts as weights, principles, or costs as related to these objects, we would no longer be dealing with Things but with Data.

(2) Data. The Dictionary of Occupational Titles, Vol. II identifies Data as:

> Information, knowledge, conceptions related to data, people, or things, obtained by observation, investigation, interpretation, visualization, mental creation; incapable of being touched; written data take the form of numbers, words, symbols; other data are ideas, concepts, oral verbalizations (2, p. 649).

It can be seen that although material objects such as paper, recordings, pencils, etc., may be involved, they are not considered as relevant to data -- only the data and what is done with them are considered in connection with data functions. Thus, an accountant's ledger is considered a Thing, but the contents of the written ledger page are Data. An individual learning how to operate a machine is dealing with a Thing, but if he is learning the principles by which the machine operates, then he is dealing with Data.

(3) People. Activities dealing with People occur frequently and on a face-to-face basis, but this is not a necessary condition for all objectives dealing with People. The primary determinant is that people are being dealt with as total human beings in their most complex form by taking into account such phenomena as their feelings, emotions, perceptions, and physiological and psychological makeup. Human relations, social skills, social conventions and the like are involved in dealing with people. Certain administrative and managerial activities, although they may not involve face-to-face interactions, require considerable knowledge of how to deal with people. And, of course, various forms of therapy, guidance, and the like necessarily require a knowledge of how to deal with people. Animals being treated as total living beings are also included in this category. An example would be training a dog to obey commands.

Levels of Functioning

This dimension of the taxonomy deals with question two, what the individual is doing with the Things, Data, or People. The basis for the Levels of Functioning (LF), which are assumed to be hierarchical, is that increasingly greater degrees of competence are required in order to perform functions at each higher level. In some cases the competencies required to perform, even at the highest LF, may be acquired in a relatively short time if it is very simple and, seemingly, innconsequential. In other cases the acquisition of the competencies may extend over long periods, which may mean years of education and training. Therefore, it is not necessarily the years of experiences which determine the level, but the kinds of experiences. Four levels are identified for each AA. No attempt has been made to make corresponding levels of each AA equivalent to each other, nor to equate the scope of each level as it might appear in Figure 1. The relationships between LF and AA appear graphically in Figure 3. Examples of verbs descriptive of functions characterizing the various levels are provided. These verbs are only examples; no attempt has been made to be exhaustive or conclusive. These descriptive words, therefore, should not be used as the sole basis for determining LF categories.

Things

(1) Handling. Activities at this level are the most elementary. In handling Things, the individual usually does not need to know their characteristics, functions, or purposes in any great detail. Therefore, extensive prior learning or training with specific objects is usually not necessary to perform handling functions adequately, although in some cases proficiency is increased through training. Very little judgment is exercised, and considerable latitude in performance may be permitted. If the individual performs these functions in conjunction with higher level functions with objects, then these handling functions are considered a part of the higher level functions. Examples of handling functions are: clean, carry, stack, sort, and pack.

(2) Operating. Operating is the second LF category. Some degree of competence is required to perform operating functions adequately. the individual must know something of the characteristics, functions, purposes, sequences, etc., of Things or parts of Things so that some prior learning or experiences in connection with Things is necessary. Some judgment and decision-making rests with the individual, with acceptable tolerance levels of these judgments and decisions quite noticeable. The purposes of these functions are generally to produce a product or perform a service. To reiterate the hierarchical nature of this dimension, if an objective is classified as "operating" it is assumed that "handling" has either been or can be demonstrated. Examples of functions at this level are: drive, control, employ, and assemble.

(3) Analyzing. Analyzing is the third LF category. It entails still greater degrees of competence and more abilities than the second level, "operating." The individual must not only know characteristics, functions, purposes, sequences, etc., of Things or parts of Things, but must know how to determine them and the relationships among various components. Thus, higher level cognitive functions are

involved, with more prior learning and training necessary to perform these functions than the lower level functions. Considerable judgment and decision-making rests with the individual, especially in terms of a final decision. Tolerance levels of judgments and decisions also become more relevant. The purposes of these functions are generally to determine physical or functional characteristics and relationships, and to identify and explain defects or malfunctions. Some examples of functions at this level are: test, assay, and troubleshoot.

(4) Inventing. Inventing is the highest LF category in the Things domain. The purpose is to put various Things or parts of Things into new relationships with one another to achieve some given end previously planned -- the accidental or chance achievement of something original is not the result of inventing functions. The elements of originality and/or creativity are necessary for inventing functions. The highest degree of competence and the greatest number of abilities are essential to function at this level. The individual needs to know characteristics, functions, purposes, sequences, etc., of Things or parts of Things. He must also understand physical relationships well enough to predict quite accurately the consequence or resultants of new relationships, interactions, configurations, arrangements, and the like. Generally, the sources of information, materials, and other things that the individual can draw upon are unlimited. Thus, the highest levels of cognitive functioning are involved, with prior learning experiences and training as prerequisites. Considerable, if not all, judgment and decision-making are responsibilities of the individual. Tolerance levels become an important consideration to achieve success. The general purpose of these functions is the development of new products. Children can perform some of these functions as well as adults. Some examples of functions at this level are: design, create, and develop.

Data

(1) Storing/Recording. Storing/Recording is the most elementary level of dealing with Data. Generally, it is not necessary for individuals who store or record data to know much about its nature or what it means. Therefore, very little training or experience in dealing with the particular data is required to perform the functions adequately. Very few, if any, complex judgments or decisions are made, with most of them predetermined or previously specified. If the individual stores or records data in the process of performing higher level functions, these lower level activities are not considered separately, but as a part of the higher level functions. Examples of functions at this level are: register, memorize, sort, post, and list.

(2) Manipulating. Manipulating, the second LF category, is a level which requires slightly more competencies than Storing/Recording. At this level the individual uses or manipulates data,

usually following prescribed procedures, rules, or requirements which he has learned previously. The data may be in verbal form such as in descriptive or explanatory date, or in numerical or symbolic form in which certain arithmetic operations may then be performed. In order to manipulate data, it is necessary for the individual to know and be able to use certain standard procedures such as rules of grammar, and mathematical procedures for calculations. Thus, some training or decision-making is exercised in these functions. The individual must have some knowledge about the nature or meaning of the data to determine if certain operations may or may not be performed with them. Examples of functions at this level are: compute, compile, edit, and translate.

(3) Analyzing. Analyzing is the third LF category in the Data area and entails more and greater degrees of competencies than the two lower levels. In analyzing, the data are scrutinized, examined, evaluated, studied carefully, segmented, and torn apart for the purposes of making inferences or interpretations, drawing conclusions, or verifying. The determination of cause and effect relationships and the identification of components are probably the most common purposes of analyzing activities. If the individual who is analyzing also simultaneously engages in activities of a lower level, but relevant to analyzing, these activities are considered a part of this higher level. For example, it may be necessary to record and manipulate during the analyzing process. To be able to analyze adequately, it is necessary for the individual to have considerable knowledge about the data and related areas, as well as the ability to analyze. Generally, the individual does not draw upon information from a host of new, or seemingly unrelated sources, as one might do in synthesis; an interpretation is based only on the present Data. Examples of functions at this level are: examine, diagnose, and classify.

(4) Synthesizing. Synthesizing is the highest LF category in the Data area and presumably commands the most and greatest degrees of competencies. In synthesis, various elements, components, ideas, concepts, etc., are brought together to formulate combinations or wholes. Since synthesis also entails the elements of newness, originality, or creativity, identity of some, or all, of its parts may be new; relationships created among these parts are also generally new. Hypotheses, generalizations, theories, and laws -- both scientific and statutory -- are products of synthesizing.

To synthesize meaningfully, the individual must have considerable knowledge or information about the data he is dealing with in order to predict the resultant or consequential combinations, interactions, reactions, etc. Furthermore, the sources of information are unlimited -- information seemingly totally unrelated to the specific areas of the data may be brought in and considered as appropriate data. Synthesizing may involve some, or even all, of the lower level functions; the reverse is not true, however. Perhaps the notion that "bigger and better things may be synthesized, but only the existing can be analyzed," is descriptive of the differences between these two functional levels. Examples of functions at this level are: generalize, theorize, and formulate.

People

(1) Serving. Activities in this LF category are the most elementary where dealing with people is involved. At this level the extent of the individual's involvement is in assisting, serving, or supporting others. Most often the functions are in response to instructions or orders laid out by a superior who is responsible for the work, or to requests from others for services. Communications are predominantly one way -- to the individual who is serving. The activities at this level are fairly routine and require little or no innovating. The individual exercises little judgment of his own and makes only the simplest decisions. The exercise of common courtesies and compliance are relevant here. Examples of functions at this level are: execute orders, take instructions, assist, and comply.

(2) Interacting. This LF category is at the next level above serving. Although interacting may occur at all levels and between persons of unequal status or power, the meaning here is restricted to that between people or relatively equal status, e.g., salesman-customer, landlord-tenant, peer-peer, worker-worker. Here the individual's principle activities are to discuss or consult with, persuade, inform, or instruct others. He exerts a direct effect upon people through interchange, yet is not wholly responsible for their activities or actions. At this level the individual is not as bound to follow detailed instructions. He takes his cues from the situation and from others and must structure his responses accordingly. Communications is predominantly two-way between the individual and the people with whom he is interacting. In functioning at this level, the individual enjoys a degree of flexibility, exercises some judgment, and makes decisions. Examples of functions at this level are: inform, discuss, instruct, and persuade.

(3) Supervising. This LF category, at the next level above interacting, requires the individual to be in a position to direct or oversee the work or activities of others. To this extent, he is also responsible for a segment of their welfare. Here the individual's principle activities are to organize, plan, and direct the activities of subordinates, usually in accordance with their capabilities. The individual functioning at this level exercises considerably more freedom of action than those at the lower levels. He exerts considerable influence, mainly through authority. He administers policy, but does not develop it. Communication is predominantly one-way, downward from the supervisor. In functioning at this level the individual requires a great deal of flexibility, must rely upon his own judgment, and is the major decision-maker for his subordinates. Examples of functions at this level are oversee and direct.

(4) Administering and Counseling. Administering and counseling are considered to be at the same LF category in dealing with people. Since they presumably require the highest degrees of competence, they are considered the highest LF categories in the People area. The kinds of functions they represent do not appear to be related in such a way that one who learns to perform one class of functions can readily perform the other. In short, they appear to be independent and require the greatest capabilities.

(a) Administering: Generally, the activities at this level tend to have a bearing on a broader spectrum of the lives of individuals than those at the lower levels. Whereas lower level activities tend to deal primarily with here and now conditions, administering activities tend to involve mainly the future conditions and welfare of individuals in a variety of ways.

To perform these activities, an individual must be able to predict: (1) general attitudes people might have concerning certain things, decisions, or actions; (2) public and individual responses toward these things, decision, or actions; and (3) subsequent consequences which might result. He must then determine what prescriptions would satisfy the future conditions. For example, the setting of the retirement age at 65 has many ramifications such as the psychological effects of terminating lifelong, daily experiences.

It is essential in establishing and administering this policy to be able to predict the path or nature of these ramifications before the policy is set. Examples of administering functions are: manage, negotiate, and formulate.

(b) Counseling: The general purpose of counseling functions is to deal with individuals in a way that will help them achieve or experience that which they desire or are capable of achieving or experiencing. In individual cases this would involve an evaluation or survey of the attributes and characteristics of the individual. On the basis of this information, a prescription of counsling for the information, a prescription of counsling for the individual can be developed.

Two general classes of abilities, both essential, are involved in performing counseling functions. One might be calle analytical, the other synthetic. Frequently the conditions found in the analysis are unique. Therefore, the prescriptions which are synthesized must frequently be unique. Examples of counseling are: treat, mediate, advise, and educate.

Individual Characteristics

The third dimension of the system answers the question, "What individual characteristics are focused on at that moment?" This dimension is concerned with what individuals acquire or gain from their experiences with Things, Data, and People. Elements of this dimension have appeared frequently in educational literature and, in general, are the focus of various tests and evaluations in assessment of educational achievement.

(1) Information. By information we mean established or factual information or knowledge which is disseminated and acquired through various forms of communications, e.g. books, lectures, and observations. Information exists independently of interpretations, values, and the like, and is accumulated every day. This process may be considered never-ending. Varying amounts and kinds of information are required to satisfactorily perform various tasks. Paper and pencil tests are a method commonly used to determine if information has been retained. Here we are concerned with the possession of information about Things, Data, and People, not with how one feels about it, how eloquently it is expressed, or the ability to use or store it.

(2) Skills. There are two general types of Skills -- mental and motor -- which are cultivated primarily through practice. Examples of mental skills are thinking, memorizing, visualizing, and perceiving. Examples of motor skills are finger dexterity, physical balance, strength, and motor coordination. Both mental and motor skills are usually demonstrated through actual performances or practical exercises. When these skills are combined in a single performance, this combination is commonly referred to as a psychomotor skill. To acquire any degree of skill usually requires repeated experiences of the same or highly similar nature.

(3) Attitudes. Attitudes are defined as acquired predispositions toward our environment in which we come to judge Things, Data, or People as having varying degrees of good-bad, favorable-unfavorable, important-unimportant, etc. Predispositions also influence behaviors, from which we infer such characteristics as responsibilities, motivations, care, and considerations. Since both the acquired predispositions and consequent behaviors in relation to Things, Data, and People are influenced and shaped by the affect of life experiences, we have included them all under the general rubric of attitudes. Attitudes are commonly measured by various attitude and personality inventories or inferred from observations of behavior.

APPENDIX C

Memorandum to CUSD Teachers

Permission has been granted by your school administration for us to request your assistance in a research project. We would like you to generate some statements of instructional objectives pertinent to your areas of teaching. The statements should present typical working objectives from your day-to-day classroom activities.

Background Rationale

We are a group of researchers from George Washington University engaged in an attempt to develop a taxonomy--a system of classifying instructional objectives--for the U.S. Office of Education. Although taxonomies exist for some specific areas of education, it is felt that there is a need for a single, more comprehensive, and probably multi-dimensional classification system that will permit classification of instructional objectives across all areas and grade levels. Because such a classification system does not now exist, educators have no basic frame of reference for generating instructional objectives, for determining the adequacy of an existing curriculum's objectives, or for comparing the objectives of one curriculum with those of another.

At present we have developed a first approximation of such a taxonomy of instructional objectives, but we need a variety of objectives statements to determine whether or not we are on the right track. We are asking you, as teachers who are in daily contact with students, to provide us with actual statements of working objectives so that we will have a realistic test of our developing taxonomy. Your objectives will help us to determine whether teachers' instructional objectives can be classified by this system. If we find that the objectives which teachers generate for their students can be classified by this system, we will continue to refine and sharpen it. Thus, it is important that we enlist your cooperation in this phase of the project.

Specific Task To Be Done

(A) Please select any two periods of instruction--each from a different grade level or subject area--from any day in your current class schedule.

(B) Indicate the subject, period of instruction, and grade/group level for each.

(C) Eliminate those objective which provide feedback to the teacher or that are diagnostic in intent. We want only statements having to do with the development of students' knowledge, skills, and attitudes.

(D) State as clearly and specifically as you can your instructional objectives that day for the two periods you select. We would like to have you list them. We can use them only if you state each objective separately rather than weaving them into a narrative paragraph.

Listed below are five objectives statements cast in both poor and good form for your reference:

Examples of Objectives Statements*

	Poor (Vague)	Good (Specific: In behavioral terms)
(1)	To understand radio circuits.	To repair a table radio containing two malfunctions, and to complete repairs in an hour, so that the radio will operate normally.
(2)	To have a knowledge of linear equations.	To solve correctly at least seven simple linear equations in 30 minutes.
(3)	To have an appreciation of the economics of the Depression of 1929.	To write a paragraph summarizing the three most important factors leading to the economic crash of 1929.
(4)	To teach the bones of the human body.	To name at least 40 of the bones in the human skeleton.
(5)	To learn how to weigh chemicals.	To be able to use the chemical balance well enough to weigh ten samples of materials, weighing accurately to the nearest milligram.

* A properly constructed objective statement is phrased in behavioral terms and tells what particular knowledge, skills, or attitudes you are aiming toward. When we say "behavioral terms" we mean that the statement specifies what the learner must be able to do or perform when the objective has been attained. If a statement is in behavioral terms and if it is at the proper level of specificity, another teacher could translate it into an indicator or measure of attainment. That is, the other teacher should be able to take the objective statement and use it to derive a behavioral situation or test item(s) to determine whether the objective has been met. Thus, as in the "good" examples listed above, the ideal objective statement is written in behavioral terms and contains the essence of its own measurement.

Administrative Note:

Work sheets are attached for your convenience. Please do your initial drafting on the blank sheet and redo your final statements on the formatted sheet; use the back of the sheet if necessary. Don't give us your names. We are interested only in the statements, not in who said what. When you have finished, tear off the formatted sheet, slip it into the envelope provided, and mail it to us.

Thank you very much for your assistance.

OBJECTIVES STATEMENTS

I. Subject:________________________________ Period:______________

Grade/Group Level:____________

Objectives:____

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II. Subject:________________________________ Period:______________

Grade/Group Level:____________

Objectives:____

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APPENDIX D

Sample of Individual Statements of Objectives

AA	LF	IC	U		
___	___	___	___	1M.	Can explain the purpose and importance of a thermostat in the operation of a motor.
___	___	___	___	2B.	Able to develop a filing system appropriate for the needs of the office.
___	___	___	___	3W.	Can clean and care for brushes and spray guns.
___	___	___	___	4M.	Acknowledges the importance of the two- and four-stroke cycle engine by identifying economical and practical uses of them.
___	___	___	___	5W.	Can identify among certain common kinds of lumber.
___	___	___	___	6W.	Able to design and construct attractive kitchen cabinets.
___	___	___	___	7M.	Can associate various descriptions of car failure with the proper malfunctions of fuel or ignition components.
___	___	___	___	8W.	Can install windows and doors in a building.
___	___	___	___	9E.	Able to spell correctly the names of items used in electronics.
___	___	___	___	10M.	Can figure the amount of interest paid in the financing of a car.
___	___	___	___	11I.	Works diligently in the process of developing a new metallic alloy.
___	___	___	___	12W.	Gains satisfaction from designing and building furniture.
___	___	___	___	13B.	Expresses satisfaction in being able to take dictation in shorthand.
___	___	___	___	14E.	Able to care for and clean tools, instruments, etc., after use.
___	___	___	___	15M.	Able to inspect and detect imperfections, damage, errors, etc., in the pneumatic system component of aircraft.
___	___	___	___	16E.	Can explain how electrical power is produced and converted to heat, light, etc.

AA	LF	IC	U		
				17H.	Can identify the common abbreviations used in food preparation such as t, c, T, and pt.
				18D.	Can use a bow compass to draw circles, arcs, and ellipses.
				19M.	Can choose the right sizes of wrenches to fit various bolts and nuts.
				20E.	Can use several models of tape recorders to play and record.
				21W.	Seeks permission to use a particular power tool when such permission is required.
				22W.	Can examine paint jobs and explain reasons why finishes blistered and peeled.
				23H.	Can name common human needs or desires and describe some characteristic behaviors that occur when they are not met.
				24D.	Can make a sketch in which straight and curved lines are combined.
				25D.	Adds simple dimensions and notes to his orthographic sketches simply as aids to interpretation or reading.
				26M.	Stresses the practice of electrical safety and hazard precautions to workers under his supervision.
				27B.	Can count sales receipts rapidly.
				28M.	Can identify various types of bolts and nuts by their design, threads, shape, and/or by the material they are made of.
				29B.	Always checks the accuracy of all work with sales slips, deposit slips, invoices, time cards, etc., by doing computations over again.
				30D.	Can distinguish among the various grades of hardness of lead in drawing pencils by the codes.
				31H.	Can quickly determine the sequence to be followed in preparing a hotel or motel room for occupancy by another party.
				32B.	Can instruct another person in the operation of an office machine.

AA	LF	IC	U	
				33H. Can peel potatoes with the power equipped peeler.
				34W. Expresses reasons for preferences for one type of laminated wood over another.
				35I. Describes in detail how he would go about designing a simple hand tool from metals.
				36M. Able to disassemble and assemble a worm and sector steering gear assembly.
				37H. Handles clothes carefully at all times to avoid making conspicuous wrinkles.
				38E. Can explain ways of testing for open circuits, shorts, and grounds.
				39M. Can perform the testing of fabric pieces and their protective coating to see if they meet specifications.
				40I. Can determine from a drawing the amount of metal needed and the cost of using different kinds of metal.
				41E. Can use a multitester (or VOM) for measuring d-c and a-c voltage, direct current, and resistance.
				42H. Can help an elderly patient to and from the bathroom, in getting in and out of bed, and taking prescribed exercise.
				43H. Handles furniture in such a way as to avoid back strain, splinters, or cuts.
				44I. Can describe several occupational opportunities and requirements for employment in metal producing and consuming industries.
				45E. Can name the different sources of electrical energy.
				46I. Can properly set up and use an arc welder to weld iron of various sizes.
				47D. Consistently tries to reduce waste to a minimum when laying out an elementary sheetmetal development by juggling the position of parts.
				48D. Can square-up and fasten a sheet of drafting paper to a drawing board.
				49D. Cleans and cares for industrial drawing instruments and equipment.

AA	LF	IC	U	
___	___	___	___	50D. Describes the procedure he would follow in testing an ignition coil.
___	___	___	___	51M. Able to apply electron theory and fundamentals to electromagnetism to troubleshoot aircraft AC power systems.
___	___	___	___	52W. Can describe some of the unique properties of different kinds of wood.
___	___	___	___	53D. Can produce a scaled drawing using information from a data sheet.
___	___	___	___	54W. Can instruct another student in the care and use of a hand saw.
___	___	___	___	55D. Can use compasses, protractors, and rulers well enough to produce figures with each.
___	___	___	___	56H. Can plan nutritious meals that are within the family budget.
___	___	___	___	57M. Can identify and locate the starter and generator on motor vehicles.
___	___	___	___	58E. Can describe how to use three common electronic test instruments.
___	___	___	___	59B. Can describe the importance of the role of the office worker in dealing with the public.
___	___	___	___	60D. Emphasizes the importance of care and accuracy in the production of a drawing.
___	___	___	___	61M. Can accurately estimate distances such as 30, 100, and 500 feet which are important to driving a car.
___	___	___	___	62D. Expresses enjoyment in experimenting with different methods of shading.
___	___	___	___	63E. Able to develop a plan for wiring a residence which would meet owner's needs and future requirements.
___	___	___	___	64H. Can describe some of the commonly accepted practices in serving food and removing dishes.
___	___	___	___	65B. Able to collect and compile information to determine the probable success of a business.
___	___	___	___	66W. Can use the card index, periodical index, and other information to find the answer to a woodworking problem in a library reference.

AA	LF	IC	U		
				67I.	Takes into account the individual's interests and aptitudes in helping him to choose a career in the steel industry.
				68E.	Can give close estimates of the cost of the repairs of appliances.
				69I.	Can describe the procedure one might follow in determining the components of an unknown metallic alloy.
				70M.	Can identify the various types of hydraulic systems used in aircraft.
				71E.	Routinely checks to make certain that the terminals are clean before soldering wires to it.
				72E.	Able to develop the evaluation tests that one might use to prove that the electronic units being tested meet specifications.
				73D.	Demonstrates the basic principles of shading and accenting by employing them consistently.
				74E.	Routinely cleans and returns tools to their storage place after use.
				75I.	Can expertly instruct people on how to use the welder.
				76D.	Can quite accurately choose houses and rooms whose dimensions are like those of a drawing.
				77M.	Is careful to maintain aerodynamic smoothness in the construction of a wing section.
				78E.	Can lace a short cable using the block or running stitch.
				79M.	Can locate a problem in the ignition system of an engine.
				80M.	Can replace a timing chain and set valve timing.
				81D.	Can design a drawing instrument which will function for a unique purpose.
				82.	Able to counsel married couples of family problems.
				83W.	Able to paint surfaces skillfully using brushes or spray guns.

AA	LF	IC	U		
				84E.	Can efficiently clean around tubes, wires, and various elements of a radio receiver or television set with rags and brushes.
				85M.	Cleans instrument panels and unit mountings of aircraft with cloth and spray cleaners.
				86D.	Can determine how to scale a drawing to accomodate the size of paper used.
				87E.	Can locate the problem when a power transformer fails to function properly.
				88W.	Conscientiously uses a dropcloth to protect the floor when painting.
				89E.	Maintains the proper demeanor in responding to questions and complaints of customers about their electrical appliances.
				90D.	Can use clay well enough to develop forms as aids to visualization.
				91W.	Exercises considerable care in applying finishes to avoid streaking.
				92E.	Can effectively sell electrical appliances to customers.
				93M.	Can explain the differences in the operation of the magneto and battery systems of ignition.
				94D.	Applies principles of good interpersonal relations in dealing with a careless worker under his supervision.
				95E.	Expresses astonishment and excitement in learning about the vastness and importance of the electronic industry to our economy.
				96E.	Can skillfully negotiate for government contracts for an electronic firm.
				97I.	Can satisfactorily solve mathematical problems involving procedures commonly used in sheet metal work.
				98E.	Can design and construct a complete experimental model of a complex unit.
				99W.	Can design and construct an original structure.

AA	LF	IC	U		
				100H.	Tactfully and skillfully advises family members in dealing with the convalescent and adjustment in the family.
				101M.	Makes sure that guards are in place on machines during their operation.
				102E.	Can effectively instruct people on the care and use of an electrical appliance.
				103B.	Can identify the agencies responsible for consumer protection.
				104I.	Can formulate personnel policies for people in the steel construction shop.
				105W.	Can write clear, concise instructions for the consumer to follow to assemble a pre-cut doll house.
				106M.	Is able to plan and design the fuel system for aircraft.
				107E.	Can make a drawing of the final circuit showing components and the location of the wiring in relation to the components.
				108I.	Can operate the lathe to turn out a metal shaft to meet tolerance specifications.
				109B.	Able to use a ten-key adding machine.
				110E.	Able to interpret and explain the theories, concepts, principles, facts, and formulas of electronic circuitry in his own terms.
				111M.	Able to determine the cause of excessive tire wear.
				112M.	Can describe the different methods of adjusting valves.
				113D.	Can identify the kinds of drawing instruments and explain their general uses.
				114D.	Can explain how to develop drawing problems with sectional and auxiliary views.
				115I.	Habitually makes sure that those observing him use the arc welder are wearing protective goggles or welding helmets.
				116W.	Stores the supplies and equipment used in the woodshop in their proper places.

AA LF IC U

___ ___ ___ ___ 117D. Interprets design features in terms of their aesthetic qualities.

___ ___ ___ ___ 118M. Displays considerable patience in trying to troubleshoot an auto malfunction.

___ ___ ___ ___ 119E. Can properly keep records of parts used and time worked on each job repair.

___ ___ ___ ___ 120E. Routinely cleans terminals with cleaning solvent after soldering.

___ ___ ___ ___ 121W. Can bore holes with a brace and auger bit.

___ ___ ___ ___ 122D. Occasionally talks about the vastness and importance of design and drafting fields of employment.

___ ___ ___ ___ 123E. Is able to explain the necessary elements in drawing a schematic diagram of a directly-heated and an indirectly-heated diode vacuum tube.

___ ___ ___ ___ 124E. Can identify the various electronic test instruments.

___ ___ ___ ___ 125B. Can engage in an effective conversation with a prospective customer about a purchase.

___ ___ ___ ___ 126I. Takes into account the advantages and disadvantages of several metals in the design of metal frames for motor vehicles and other carriers.

___ ___ ___ ___ 127D. Demonstrates familiarity with the basics of industrial economics by using an example with a hypothetical industry.

___ ___ ___ ___ 128D. Can recite the decimal equivalents of commonly used fractions.

___ ___ ___ ___ 129E. Able to memorize the price lists of various types of resistors, capacitors, and amplifiers.

___ ___ ___ ___ 130M. Describes the kinds of valve designs and explains the principles of their operation.

___ ___ ___ ___ 131M. Cleans and cares for hand tools after use without being told.

___ ___ ___ ___ 132H. Can skillfully instruct tenants on the care and use of laundry facilities to insure their compliance.

___ ___ ___ ___ 133B. Carries out work assignment conscientiously and promptly.

AA	LF	IC	U		
___	___	___	___	134E.	Can develop and describe an experiment confirming Ohm's law.
___	___	___	___	135M.	Can skillfully and tactfully instruct ladies on such tasks as changing a tire, checking the oil, and cleaning the windshields.
___	___	___	___	136D.	Works well within the limits of tolerance and dimensioning practices in producing drawings.
___	___	___	___	137B.	Able to locate discrepancies in bookkeping records whether they be computational, entry, or other errors.
___	___	___	___	138E.	Can expertly instruct others in the diagnosis and repair of electronic equipment.
___	___	___	___	139M.	Can demonstrate the principles of carburetion by designing a working model of a carburetor.
___	___	___	___	140B.	Makes work assignments to workers in a tactful and pleasant manner.
___	___	___	___	141D.	Plans and constructs a flow chart showing the steps in the construction or manufacture of an article.
___	___	___	___	142M.	Uses drop cloths carefully when getting into cars, leaning over fenders, etc.
___	___	___	___	143M.	Describes the procedure he would use in locating a problem in the power train when the car fails to move.
___	___	___	___	144I.	Can describe two ways of surface treating and finishing of various kinds of metal.
___	___	___	___	145M.	Can describe how the auto pilot and approach control systems are used by a pilot in landing a plane.
___	___	___	___	146H.	Can describe some of the consequences of inadequate personal hygiene and sanitation in handling foods.
___	___	___	___	147M.	Can describe the pattern used for tightening engine head nuts and explain why such a pattern is necessary.
___	___	___	___	148B.	Able to take meaningful notes of a lecture in Gregg notehand.
___	___	___	___	149E.	Able to calculate the amount of voltage, current, and resistance in series, parallel, and series-parallel circuits.

AA	LF	IC	U		
				150I.	Can define what is meant by annealing and describe the process by which this is accomplished.
				151B.	Displays interest in learning how to deal with customers in a business by asking questions about customer relations.
				152I.	Expresses enjoyment in instructing people in dealing with the hand tools and machines in the shop.
				153M.	Can explain the construction and operation of fluid drive.
				154W.	Expresses interest in participating in lively discussions about woodworking with his classmates.
				155M.	Can name the various warning systems on a given aircraft.
				156M.	Can design a carburetor which uses water as the fuel.
				157B.	Can arrange items for sale in an attractive display.
				158W.	Expresses feelings of accomplishment in being able to carry out simple home maintenance jobs such as replace a hinge, door lock, or piece of molding.
				159I.	Can choose the sizes of bolts needed to fit various size holes in steel quite accurately.
				160M.	Can parallel park a car between two others.
				161W.	Works cooperatively with others on a common project.
				162E.	Can connect components of an electronic apparatus as shown in a circuit diagram.
				163B.	Shows interest in business trends by reading books and articles about them.
				164W.	Can set up and operate a wood lathe to produce a simple wood product.
				165I.	Is careful not to place hot forged metal objects where someone will accidently pick them up or put something on them.
				166B.	Can explain the importance of business competition to our economic system.
				167W.	Can start and drive a screw with a screw driver.

AA	LF	IC	U		
				168M.	Can prepare a personal resume for employment purposes.
				169H.	Deals with supervisors in a courteous and tactful manner when receiving assignments.
				170D.	Can be depended upon to work alone to complete assigned tasks.
				171D.	Can expertly instruct people on the techniques of inking drawings, sketches, and tracings.
				172M.	Can describe the advantages and disadvantages of various types of wheel suspension.
				173W.	Can sharpen a wood chisel on a grindstone.
				174E.	Can describe how to make a soldered connection to a turret terminal using a single wire with a 360 degree wrap.
				175D.	Can identify the abbreviations and symbols used in labeling and detailing drawings.
				176B.	Can prepare a federal income tax return using data provided for itemizing deductions.
				177B.	Can figure the cost of installment buying such as a car or furniture.
				178I.	Operates the drill press with too little rather than too much pressure to avoid damage to the bit.
				179M.	Can identify the various indicators on the instrument panel of modern cars.
				180M.	Follows manufacturer's and FAA specifications routinely and precisely in the assembly and rigging of aircraft structures.
				181B.	Can examine sales records and determine causes of large fluctuations over time.
				182H.	Can operate a sewing machine to mend, repair, and make simple alterations on clothing.
				183D.	Demonstrates the methods of obtaining spacing, balance, and proportion in lettering.
				184M.	Can accurately read settings on a micrometer.
				185W.	Able to design and build an attractive model home.

AA	LF	IC	U		
				186M.	Can change a tire using the equipment commonly found in a service station.
				187D.	Can answer questions in a written test about technical information in the industrial drawing text book.
				188I.	Can identify various types of abrasives and explain the principle use of each.
				189M.	Applies money saving techniques in purchasing auto supplies and equipment.
				190W.	Able to estimate the amount and cost of materials and time necessary to complete a job by looking at the blueprints.
				191D.	Can conceive and draw geometric patterns which have decorative qualitives.
				192D.	Uses the basic drawing instruments carefully and correctly to avoid damage to them.
				193M.	Can translate signals from the weather radar systems into verbal descriptions of the weather.
				194H.	Can read and interpret the legal and practical regulations of the housing project.
				195E.	Exercises caution with tools and other equipment when repairing radios and television sets.
				196M.	Can diagnose problems in cars in which the automatic spark advance and retard systems are not functioning properly.
				197B.	Can explain the differences between negotiables such as preferred and common stocks, bonds, certificates, etc.
				198W.	Checks to make sure that paint brushes are as clean as possible before storing them.
				199E.	Can give an interesting report on the transitorized circuit and its development.
				200M.	Can describe the differences among jet, ramjet, turbojet, and fanjet engines.
				201D.	Can draw oblique pictorial sketches using horizontal, vertical, and slant lines parallel to oblique axes.

AA	LF	IC	U		
				202I.	Can shape forged metal to form simple objects using only a hammer and anvil.
				203M.	Can explain the relationship of ignition timing to the operation of the engine.
				204D.	Works cooperatively with others on various drafting activities for a school project.
				205B.	Can operate a cash register.
				206D.	Can describe the procedures for producing two- and three-view orthographic drawings.
				207H.	Can determine the amount and kind of linen and supplies needed to make up the double and single rooms from looking at the assigned motel or hotel room report.
				208I.	Visits an exhibit where artistic objects of metal are displayed.
				209B.	Can record sales information from sales slips correctly and rapidly.
				210E.	Checks to make sure that all leads are marked before removing and replacing a power transformer.
				211B.	Can identify and describe the various types of duplicating materials such as ditto, stencil, and multi-lith.
				212I.	Can determine the amount of weight a steel structure will support given the appropriate data.
				213B.	Can determine the limits of warranties on various products as shown on the warranty papers.
				214W.	Can describe the procedures for operating the radial-arm saw to cut angles and dadoes.
				215M.	Points out specific features of auto design which are especially appealing to him and those that are not.
				216I.	Can classify the different properties of several kinds of metals into an adequate system for a specific purpose.
				217E.	Can adjust and seat brushes on a generator.
				218H.	Can properly use the vacumn cleaner and all of the attachments.

AA	LF	IC	U		
___	___	___	___	219D.	Uses contour and surface enrichment and other embellishments on drawings simply to improve the appearance.
___	___	___	___	220I.	Can describe the procedures used in surface decoration and etching with various kinds of metals.
___	___	___	___	221W.	Can describe some of the social skills which are considered especially desirable in helping and serving people.
___	___	___	___	222B.	Able to type 30 words per minute.
___	___	___	___	223 .	Able to recommend a course of action for a delinquent youth.
___	___	___	___	224M.	Can invent a safety device for the automobile.
___	___	___	___	225E.	Can describe the electron theory and electron flow using hydrogen and copper atoms as examples.
___	___	___	___	226D.	Habitually employs safe practices in the care and handling of instruments, equipment, and supplies.
___	___	___	___	227M.	Can list 10 occupations and professions in the field of power mechanics.
___	___	___	___	228M.	Acknowledges the challenge of trying to locate malfunctions or problems in turn and bank, horizon, and yaw instruments.
___	___	___	___	229H.	Expresses the importance of physical examinations, testing, and other ordinances for food service workers.
___	___	___	___	230M.	Can repair a wooden rib using one of several approved splices.
___	___	___	___	231E.	Can describe how to use mathematical formulas to solve circuit problems.
___	___	___	___	232W.	Can sort the various sizes and standards of bolts, screws, and other types of fasteners.
___	___	___	___	233M.	Can identify landmarks in the history of the development of rocket and jet engines.
___	___	___	___	234M.	Can weld a break in a fender.
___	___	___	___	235I.	Given the AISI or SAE number, can name the carbon and alloy steel and list common products of these metals.

AA	LF	IC	U		
				236W.	Can skillfully drive nails with a hammer.
				237I.	Assigns welding jobs to workers and assures their completion.
				238W.	Can describe how to install, adjust, and select abrasives used on sanding machines.
				239D.	Expresses satisfaction with having memorized all symbols and abbreviations used in drafting.
				240D.	Examines prints of typical assembly drawings and component detail drawings prepared and used in local industry for accuracy, ease of interpretation, and identification of accepted drawing room practices.
				241W.	Can use mathematics to solve problems in measuring and cutting wood.
				242W.	Able to figure out ways to cut lumber to reduce waste.
				243W.	Able to describe the purpose and use of the five most common types of roofs used in houses.
				244M.	Able to balance and rig control surfaces to ensure smooth, flutter-free operations.
				245M.	Can describe the differences in the operation of two- and four-stroke cycle engine.
				246E.	Can explain the principles of how a simple dc voltage-divider circuit operates.
				247M.	Able to grind, seat, and adjust a valve.
				248M.	Can explain adequately how one would go about locating malfunctions in hydraulic and pneumatic control systems of aircraft.
				249W.	Can properly clean and oil hand tools.
				250D.	Can draw plans for a typical stairwell section.
				251H.	Can lecture in an interesting and stimulating manner while putting on a demonstration of food preparation for housewives.
				252D.	Routinely returns drawing instruments to their storage cases when finished with them.
				253E.	Able to design and construct a power supply and amplifier chassis.

AA	LF	IC	U		
				254W.	Explain the importance of kiln- and natural-drying wood.
				255E.	Able to design his own component arrangement for mounting components on the chassis.
				256I.	Expresses a willingness to assist people on jobs and is helpful whenever the opportunity occurs.
				257W.	Can identify 10 occupations and professions in the field of woodworking and related areas.
				258D.	Can explain the difference between oblique and one-point perspective relationship and the isometric and angular or two-point perspective relationship.
				259H.	Can estimate closely the amount of food required for a party of a particular size.
				260D.	Can prepare a clearly understandable written description to accompany a drawing which shows various parts of an object, their position, sequence, and order of assembly.
				261E.	Can choose the proper packing materials for wrapping and packing electronic devices for mailing.
				262D.	Explains how to talk to people on the telephone to demonstrate some principles of good interpersonal relationships.
				263E.	Can make an accurate written report of a test of the audio output of amplifier made with a signal generator and output meter.
				264I.	Can determine the components of metallic alloy and the proportions of each component through various kinds of tests.
				265B.	Able to develop a plan for the arrangement of offices and office workers in a business which will provide the greatest efficiency of operations.
				266M.	Collects additional information on hydraulic systems because of interest in this area.
				267W.	Is consistent about returning tools to their proper place when finished with them.
				268I.	Stacks stock metal in neat, compact piles.

AA LF IC U

___ ___ ___ ___ 269E. Can determine causes of malfunctions in an electric motor and make the necessary repairs.

___ ___ ___ ___ 270W. Able to lay out and cut rafters, studs, and joints and nail them in place.

___ ___ ___ ___ 271 . Able to treat patients with therapy.

___ ___ ___ ___ 272E. Can install outlet boxes, mounting switch boxes, junction boxes, fixture boxes, and cabinet and cutout boxes.

___ ___ ___ ___ 273D. Can make accurate multi-view drawings from a real object or picture.

___ ___ ___ ___ 274H. Talks to the occupant of the room in a friendly and courteous manner.

___ ___ ___ ___ 275W. Can determine the basic ingredients in finishes, stains, fillers, etc., through various kinds of tests.

___ ___ ___ ___ 276W. Expresses that he likes to use a saber saw to cut circles and other patterns.

___ ___ ___ ___ 277M. Can adjust the charging rate of a generator.

___ ___ ___ ___ 278B. Can give several important uses of business records and reports to the individual as a proprietor of a business.

___ ___ ___ ___ 279W. Expresses sincere willingness to help or be of assistance to others in the woodworking shop.

___ ___ ___ ___ 280E. Able to identify the basic hand tools used in electronics.

___ ___ ___ ___ 281H. Insures that children carry out their household tasks and accustomed responsibilities in the family.

___ ___ ___ ___ 282E. Can explain what is meant by resistance and its relation to electricity.

___ ___ ___ ___ 283E. Can recite the essence of Kirchoff's law.

___ ___ ___ ___ 284D. Can apply the basic rules of dimensioning in a drafting problem.

___ ___ ___ ___ 285B. Can sort papers rapidly according to various classifications such as date, code number, alphabet.

___ ___ ___ ___ 286D. Can design simple machines and make working drawings.

AA	LF	IC	U		
				287M.	Handles tools, materials, and other objects carefully to avoid damage to them.
				288M.	Can identify a micrometer and tell what it is generally used for.
				289I.	Can cut pieces of metal skillfully using both the acetylene torch and hack saw.
				290B.	Can be depended upon to carry out assignments without supervision.
				291B.	Able to apply the rules of English grammar to edit written material.
				292H.	Carries out instructions of the specialist accurately and cheerfully in caring for patient.
				293M.	Can locate the points for lubrication on different makes of cars with the aid of an automotive manual.
				294B.	Wraps packages of merchandise carefully and neatly to the customer's satisfaction.
				295I.	Can list the special characteristics that alloying elements give to steel when added.
				296B.	Can write an acceptable transcript of simple material in shorthand.
				297D.	Can use the various kinds of lettering instruments.
				298I.	Always goggles or protective shield when using the grindstone or emery wheel even for very short periods.
				299H.	Can choose clothes which are appropriate and acceptable in appearance for the job.
				300I.	Lifts heavy metal objects in the proper manner to avoid injury and strain.
				301H.	Can examine a wardrobe to determine the type of repair, alteration, and cleaning required for the clothing.
				302E.	Able to use the mathematics formula to calculate the capacitance and inductance in series and parallel circuits.
				303B.	Can change a ribbon in a typewriter.

AA	LF	IC	U		
				304D.	Can redesign and make working drawings of machine parts.
				305D.	Can describe the technique of measuring, enlarging, and reducing by squares to demonstrate knowledge of method.
				306D.	Can use accurately the color symbols used in drawing.
				307M.	Checks to make sure that the crankshaft and the con-rod are clean before replacing the con-rod.
				308B.	Can explain what is meant by free enterprise.
				309M.	Uses only "clean" language when talking to other students.
				310D.	Can identify and explain the similarities and differences among simple graphic interpretations; orthographic projections; and isometric, scaled, and working drawings.
				311I.	Is able to design steel structures which are functional as well as decorative.
				312M.	Able to locate a short in the electrical system of an automobile which causes the battery to run down.
				313M.	Can perform satisfactorily maintenance jobs such as washing a car, cleaning chrome, waxing painted surfaces, cleaning upholstery, and removing stains.
				314I.	Can drill the holes and rivet two pieces of metal together using a ball-peen hammer and anvil.
				315D.	Fills pens only with the proper drawing inks to demonstrate respect for the values of the instruments.
				316D.	Can locate an error in the drawing when the lines do not meet as they should according to the data.
				317W.	Conscientiously keeps records of materials used in the construction project.
				318H.	Records time spent on each homemaking task and determines percentage of the total time spent in each task.
				319E.	Able to develop a simple theory applicable to electronic phenomena.
				320E.	Can identify a motor by its winding.

AA	LF	IC	U		
				321M.	Expresses interest in trying to locate malfunctions in solid state inverters.
				322D.	Can identify the kinds and grades of drawing paper.
				323M.	Can calculate the power of the batteries given the information from the electrical measuring and indicating devices.
				324M.	Can explain how to calculate the horsepower of small engines.
				325D.	Makes acceptable blueprints using the sunlight exposure method.
				326M.	Can wrap and package precision tools for mailing or shipping.
				327B.	Follows conscientiously a plan for studying that he has developed.
				328I.	Can develop an alloy product which will satisfactorily meet the requirements of use and practicality.
				329D.	Makes corrections in his sketches neatly and cleanly.
				330W.	Able to figure the amount of board feet from specifications.
				331E.	Faithfully follows the safety precautions necessary when troubleshooting high voltage amplifiers.
				332E.	Customarily addresses his employer as "sir."
				333E.	Can identify radio and television parts that are listed on a parts list.
				334I.	Can develop a theoretical formula for the reactions of metals to a treatment after a study of various tests.
				335H.	Uses sanitary practices related to tasting food when cooking.
				336E.	Can explain the principles with which signal systems such as battery operated bells, burglar alarms, and electric door openers work.
				337B.	Can list the advantages and disadvantages of corporations, cooperatives, and private business.
				338B.	Can clean and otherwise care for a typewriter.

AA	LF	IC	U		
				339D.	Can list occupations and professions in the field of drafting and related areas.
				340W.	Can define common terms used in the woodworking and construction trade.
				341M.	Can remove and replace a cylinder head.
				342H.	Can list five community agencies which employ Visiting Homemakers.
				343W.	Able to determine when a specialized operation would be advantageous to meet specifications by studying the construction specifications.
				344E.	Can explain how a tube acts as an oscillator.
				345H.	Can properly bathe a baby.
				346M.	Can sew fabric covering using a power sewing machine.
				347M.	Habitually returns all tools to their proper storage place after use.
				348B.	Able to compose replies to business letters.
				349M.	Can remove and replace ignition points.
				350D.	Checks over reproductions of drawings to insure everything is clear and legible.
				351M.	Can determine the approximate cost of an engine repair.
				352I.	Can describe the procedure he would follow in tempering steel to make a given product.
				353D.	Assumes the responsibility for taking care of the tools, equipment, and supplies before and after use.
				354B.	Can handle sales slips, invoices, or deposit slips that are not of uniform size rapidly with one hand as in totaling.
				355M.	Can choose the proper cleaning solvents to be used in cleaning upholstery.
				356D.	Can identify prominent Americans in history who started their careers in drafting.
				357E.	Can explain the process of wave propagation as it is described in physics.

AA	LF	IC	U		
___	___	___	___	358D.	Can make a simple isometric drawing which includes only three sets of parallel lines.
___	___	___	___	359D.	Hands in drawing assignments on time.
___	___	___	___	360E.	Can write an interesting essay on the importance of electronic technicians to industry.
___	___	___	___	361M.	Can determine the savings in financing a car purchase by one method over another.
___	___	___	___	362B.	Able to identify the more common types of business forms used in the office.
___	___	___	___	363B.	Expresses the importance of writing numbers clearly in recording sales records.
___	___	___	___	364E.	Can invent a device using a photo-electric cell.
___	___	___	___	365H.	Knocks on door with fingers, not keys, to determine if motel or hotel room is vacant.
___	___	___	___	366I.	Conscientiously keeps records of steel and welding rods used on the job.

APPENDIX E

Memorandum to Consultant Panel

Background

We are engaged in an attempt to develop a taxonomy, a system of classifying instructional objectives for the U.S. Office of Education. As you know, taxonomies exist for some specific areas of education, but it is felt that there is a need for a single, more comprehensive classification system that will permit classification of instructional objectives across all areas and grade levels. Because such a classification system does not now exist, educators have no basic frame of reference for generating instructional objectives, for determining the adequacy of an existing curriculum's objectives, or for comparing the objectives of one curriculum with those of another.

At present, we have developed a first approximation of such a taxonomy of instructional objectives and we now need your help to determine whether or not we are on the right track. The basic taxonomy of educational objectives has been outlined in the form of a matrix of (1) three Activity Areas, (2) four Levels of Functioning, and (3) three types of Individual Characteristics.

Outline of Taxonomy

(1) The Activity Areas (Things, Data, People) are concerned with what individuals are dealing with in their learning experience. Any educational objective is assumed to be related to Things, Data, or People. "Things" refers to all physical or tangible objects other than humans. "Data" refers to ideas, concepts, abstractions, and other intangible phenomena which are usually in the form of numbers, words, or symbols. "People" refers to *total* human beings or animals being treated as humans.

(2) The Levels of Functioning concern what individuals *do* with the Things, Data, or People. Four Levels of Functioning, presumably hierarchical, are identified and defined for each Activity Area. Hierarchical means that increasingly greater degrees of competence across a wider variety of content is required to function at each higher level. The levels as they are defined are unique to each Activity Area so that there are four Levels of Functioning in each, for a total of 12 Levels of Functioning.

(3) Individual Characteristics are concerned with what individuals *acquire* as a result of their learning experiences. The characteristics which appear quite frequently, in one form or another, in educational literature are identified here as Information, Skills, and Attitudes. In general, "Information" is *factual* material or content which is provided for the individual through various forms of classroom communication. "Skills" are of two general types--*cognitive* and *motor*--and concern those abilities which are developed through practice. "Attitudes" are acquired predispositions

toward Things, Data, or People, and to a large extent are the bases for inferring personality characteristics.

The two attached figures (see pages 2 & 4) illustrate how the taxonomy is put together. Figure 1 shows, in schematic form, how the 3 x 4 x 3 matrix forms a 36-category classification system. Figure 2 illustrates how each Level of Functioning is related to the other levels in the three Activity Areas. This figure also provides several verbs at each level to indicate the kinds of activity that occur at a given level. Also included in Figure 2 is a brief description of the three types of Individual Characteristics.

Task to be Accomplished

We want you to study the taxonomy so as to be thoroughly conversant with it, and then take a sample of statements of instructional objectives which we have prepared, classifying them one by one according to the taxonomy. Now that we have developed a basic taxonomy, we need to see if, in fact, it can be used by independent judges as a tool for classifying objectives. Will they agree in their judgments? If we find that, in general, this panel of consultants agrees in classifying these objectives, we will feel that we are on the right track to developing a reliable and useful classification system.

We have prepared approximately 370 individual statements of objectives across a wide variety of subject matter, which, after study, orientation on the matrix, and practice we will want you to classify.

> NOTE: The objectives statements have been written so that each of the 36 categories of the matrix is represented, but not in equal numbers. So don't attempt to put an equal number of statements in each category. It won't work.

The Process of Categorizing Statements

You will find the 366 statements to be categorized in the accompanying booklet* Each statement is preceded by four blanks in which you are to indicate your judgment as to proper classification. (The single letter accompanying each statement number is merely a subject-area coding for our convenience in analysis, so ignore it.)

Arrange your work space so that you have the sheets of statements, and Figures 1 and 2 arranged in front of you. Take each statement, one at a time, read it, and study its elements in reference to Figures 1 and 2. Then decide where the statement falls along each of the dimensions of the matrix (AA,LF,IC). Indicate your judgments by inserting the first 2 letters of the appropriate designation in the first 3 blanks. For instance, if you think that Statement # 1 should be classified in the "Things" Activity Area, in the "handling" Level of Functioning, and in the "skills" Individual Characteristic, the blanks would be filled in like this:

AA	LF	IC	U
Th	Ha	Sk	

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* See Appendix B

If you can classify the statement along only one or two of the dimensions, do, but make every effort to achieve the complete 3-way classification for each statement. If you think that the statement defies classification, if you just don't think the taxonomy will classify the statement, enter an "x" in the blank under the letter "U", and leave the other blanks unmarked.

Reread, edit, change your judgments as often as you like. But as you proceed, treat each statement as an independent item to be thought about carefully and classified. They are independent statements and not interrelated. Do not attempt to achieve balance; don't look for patterns. Classify each statement as it comes up, giving each one your best analytic thought. There is no definite "right" or "wrong" answer for each item; we are interested in your judgment and agreement or disagreement with other judges. We would prefer that you work independently of the other members of the panel. Please do not consult with them if you are unsure as to how to classify a statement. We want to know how you will classify the statements.

APPENDIX F

Detailed Analysis of Categorizations of Objectives by Judges

In scoring the data, it was decided to score each dimension independently of the other. The AA and IC dimensions could already be considered independently, but LF's were unique to each AA so that judges who disagreed on the AA of an objective, automatically disagreed at least qualitatively on the LF. To make each dimension independent for scoring purposes, LF was scored simply as the first, second, third, and fourth level regardless of the chosen AA.

In the analyses of the data, there were no "correct" classifications of the objective; analyses were based solely upon agreement between successive pairs of judges. In preparing the objectives, however, some classification was assumed simply for the purpose of achieving a distribution across the taxonomic categories.

There were five general questions to be answered by this phase of the research: (1) What was the degree of agreement among judges in the classification of the objectives? (2) What was the effect of the judges' background upon the degree of agreement? (3) Did agreement among judges vary as a function of the taxonomic dimensions? (4) Did agreement among judges vary as a function of the educational content areas of the objectives? (5) Did the wording of objectives affect the degree of agreement among judges?

It should be recognized that the amount of agreement between judges could be affected by: (1) The judges' interpretation of the taxonomy and its definitions; and (2) the degree of precision allowed by the terms used in the objective statements. Since all of the statements for a particular content area were prepared at one time, it was possible that a particular "writing set" could have pervaded undetected. To examine this possibility, all comparisons between pairs of judges were pooled for each content area, and the percent of agreements between pairs of judges were computed for each taxonomic dimension separately (AA, LF, and IC) and for all three dimensions simultaneously (AA + LF + IC). These are shown in Table 1.

Table 1

Percent of Between-Judge Agreement in the Three Taxonomic Dimensions Separately and All Dimensions Simultaneously for Each Educational Content Area

Course	Activity Area	Levels of Functioning	Individual Characteristics	All Three Dimensions
Mechanical	.75	.67	.71	.42
Business	.76	.63	.75	.42
Woodworking	.82	.74	.77	.54
Homemaking	.84	.68	.62	.39
Metalworking	.80	.69	.68	.42
Electronics	.82	.62	.69	.39
Drafting	.74	.65	.74	.37

Differences possibly due to course content are minimal. Some minor variations are shown within dimensions, but these variations were not correlated across the dimensions. The rank correlation coefficients of agreement in the seven content areas were as follows: AA with LF, .28; AA with IC, .38; LF with IC, .00. None are significant at the .05 level.

The effect of educational content on obtaining agreement among judges does not seem to be a major determinant. It should be noted, however, that many statements would be equally applicable across content areas by simply changing a few words. Also, as noted earlier, unfamiliar technical terms and jargon peculiar to content areas were avoided.

A. Agreement Among Judges:

The results in Tables 2-4 show the percentage of agreement between pairs of judges for each taxonomic dimension -- AA, LF, and IC. These data are accumulated across the seven educational content areas which, hopefully, provide a better indication of agreement among the judges. In general, agreements among judges A, B, and E are higher than the others, but these differences are not large.

Table 2

Percent of Agreement Between Pairs of Judges in the AA Dimension

	Judge A	Judge B	Judge C	Judge D	Judge E	Judge F	Judge G
Judge A							
Judge B	91						
Judge C	78	82					
Judge D	73	75	69				
Judge E	85	87	81	75			
Judge F	69	71	72	71	80		
Judge G	84	86	85	72	88	75	

Table 3

Percent of Agreement Between Pairs of Judges in the LF Dimension

	Judge A	Judge B	Judge C	Judge D	Judge E	Judge F	Judge G
Judge A							
Judge B	77						
Judge C	74	68					
Judge D	60	63	57				
Judge E	79	75	67	59			
Judge F	66	66	58	51	67		
Judge G	70	71	63	61	76	64	

Table 4

Percent of Agreement Between Pairs of Judges in the IC Dimension

	Judge A	Judge B	Judge C	Judge D	Judge E	Judge F	Judge G
Judge A							
Judge B	87						
Judge C	84	80					
Judge D	65	67	67				
Judge E	67	67	58	67			
Judge F	78	74	73	64	69		
Judge G	78	74	67	61	71	79	

Table 5

Percent of Agreement Between Pairs of Judges Simultaenously in All Three Dimensions

	Judge A	Judge B	Judge C	Judge D	Judge E	Judge F	Judge G
Judge A							
Judge B	63						
Judge C	51	45					
Judge D	36	38	34				
Judge E	51	48	37	35			
Judge F	39	39	35	29	40		
Judge G	50	50	39	31	50	40	

The percentage of agreement for each judge with all other judges in the AA, LF, and IC dimensions and overall, is shown in Table 6. If we assume the majority judgment to be most accurate, then the individuals with the highest averages would agree more frequently with the majority and, therefore, be the most accurate.

Table 6

Percent of Agreement of Each Judge With All Other Judges in Each of the Three Dimensions and Overall

Dimensions	Judge A	Judge B	Judge C	Judge D	Judge E	Judge F	Judge G
Activity Areas	80	82	78	73	83	73	82
Levels of Functioning	71	70	64	59	70	62	67
Individual Characteristics	76	75	71	65	66	73	72
All Three Dimensions	48	47	40	34	43	37	43

The data shows that the judges with the highest averages were the two members of the research staff. It was expected that they would be the most familiar with the taxonomy and with the way the objective statements should be written. The judge with the lowest average, who, incidentally, had the lowest average in all taxonomic dimensions, missed a large part of the four-hour training session and had to depend primarily on the brief practice session and the written materials provided. Still, his average is only slightly lower than those of the other judges.

Rank correlation coefficients of the average judge agreements for each pair of the taxonomic dimensions (AA-LF, AA-IC, LF-IC), and for overall (AA-LF-IC) agreement in all three dimensions, are shown in Table 7. Perhaps the low correlation between AA and IC is due to the small variations among the averages of the judges on these dimensions.

Table 7

Rank Correlation Coefficients Between Taxonomic Dimensions

N = 7	Activity Area	Levels of Functioning	Individual Characteristics	Three Dimensions
Activity Area				
Levels of Functioning	.75*			
Individual Characteristics	.12	.62		
Three Dimensions	.70*	.93*	.72*	

$*p < .05$

These data seem to indicate that experience with the taxonomy is an important consideration. However, it is extremely encouraging to find considerable agreement among judges after only a few hours training. The backgrounds of the judges who were not members of the research staff do not seem to affect judgments appreciably, i.e., the averages for the academic teachers (females) were as high as those for the vocational-industrial teachers (males).

B. Agreement by Taxonomic Dimension:

In the previous section, the focus was on the amount of agreement as a function of the judges. In this section, we shall focus on agreement as a function of the taxonomic dimensions.

The percentage of agreement between judges within each taxonomic dimension and overall was computed by combining all judgments across all seven educational content areas. The percentage of agreement with regard to AA was the highest (78%), followed by IC (71%), and then LF (66%). The percentage of agreement overall was 42%. These data indicate that it may be hardest to judge the LF dimension; partly because the LF contains an extra category, and partly because, being hierarchical, it may be viewed as a continuum and, therefore, treated as a rating scale. As shown in Table 7, there is a general tendency for judgments of the taxonomic dimensions to be correlated.

Another point of interest was to determine if agreement in LF was higher for any of the three AA categories. To do this, only those objectives on which at least six of the seven judges agreed on the AA category were examined. There were 249 such objectives. Of these, 121 objectives were judged as being in the Things category and on 93 of these objectives (77%), six of the seven judges also agreed on the LF. Ninety-two objectives were judged as being in the Data category, and on only 33 (36%) of these did six of the seven judges agree on the LF.

Finally, 36 objectives were judged as being in the People category, and on 25 of these (69%), six of the seven judges agreed on the LF. These results seem to indicate that obtaining agreement on LF for objectives dealing with Data is more difficult than for those dealing with Things or People; and, that obtaining agreement on AA categories is easiest followed by IC and LF in that order.

C. Agreement by Educational Content:

Although the sampling of educational content areas was far from exhaustive, it seemed appropriate to examine, briefly at least, this aspect as related to the taxonomy. It seemed possible that objectives written for particular educational content areas could have been more easily judged than others. This does not seem to be the case, as indicated in Table 1.

D. Wording of Statements:

In this section, agreements among judges will be examined with respect to the characteristics of the objectives, especially the way they were worded. Only groups of objectives sharing common wording characteristics will be examined. The objectives are not stated to allow entirely homogenous categorizations according to words, but certain similarities seemed to be appropriate for grouping.

It was recognized early that the precise wording of the objectives would play a significant part in obtaining agreements in their categorizations by judges. Mager (20) and Ammerman and Melching (21), to name a few, have expressed the importance of stating objectives in the proper terms, and have described in considerable detail how this can be accomplished. If the terms used to describe categories in the taxonomy were sufficiently exhaustive and precisely defined, and if only those terms were used in stating the objectives, we would expect especially high agreement among judges in the categorizations of them. It was felt that a fairer test of the taxonomy, however, would employ objectives expressed in various terms, some of which appear in the taxonomy, and some of which do not.

There were 88 objectives in which the verb forms used in describing the functions in the objectives were also listed as descriptive examples available to the judges in the taxonomy (Figure 2)* Complete agreement among all judges on LF was obtained on only 40 of these, indicating that at least some judges chose to ignore the cue and worked directly with the statements. Of these 88 objective statements, 15 contained the word "identify" as conveying the function followed by the name of concrete objects, e.g., "can identify among certain kinds of lumber." The distributions of the judgments of the seven judges for the three taxonomic dimensions are shown in Table 8.

Table 8

Number of Judgments for Each Taxonomic Category of Selected Objective Statements Containing the Word "Identify"

Dimension	Things	Data	People	
Activity Area	72	33	0	
	First	Second	Third	Fourth
Level of Functioning	92	8	5	0
	Information	Skill	Attitude	
Individual Characteristics	50	55	0	

The term "identify" seemed to imply three different kinds of activities: (1) "point out" or discriminate, characteristic of the first LF category; (2) a request to "supply an acceptable explanation of" characteristic perhaps of the second LF category; and (3) "an analysis of" a characteristic of the third LF category. Apparently these interpretations also made differences in agreement on AA and IC where the judgments were now equally divided.

In AA, the choices were limited to the Things and Data categories. The notion that data must be used to "make a discrimination" is offered as a possible explanation for the choice of the latter. In IC, the choices were almost equally split between Information and Skills. The auxiliary verbs "able to" and "can" were used quite frequently, and since these imply abilities or capabilities, judgments in favor of Skills could have been based on these auxiliary verbs.

There were 51 objectives in which the verb form "can explain," or "can describe," were used, e.g., "can explain how electrical power is produced and converted to heat, light, etc." In making their choices, the judges were informed not to assume that individuals who could give an explanation of an activity could also perform the activity. It was to be assumed only that the individual possessed the information of how to perform the act; that actual performance was necessarily the basis for inferring skill. Therefore, objectives in which the terms "explain" or "describe" appeared were generally expected to be judged as Information in the IC dimension. The choices of the seven judges in the IC dimension for these 51 objectives showed 59% for Information, 39% for Skills, and 2% for Attitudes. The judgments in favor of Skills, it was determined, were almost entirely attributable to four judges, two-thirds of whose judgments were in favor of the Skill categories alone. Perhaps the auxiliary verbs "able to" or "can" again were of some consequence, or the instructions given in training were not interpreted uniformly.

Fifty-one objectives, on which there was complete agreement among all judges across all three taxonomical dimensions, were examined to determine if a "prototype" existed. By far the most common types were Things-AA, Operating-LF, and Skills-IC, e.g., "can properly set up and use an arc welder to weld iron of various sizes." None of the objectives used, which met the criteria of total agreement by all judges in all dimensions, involved the Data-AA category or the Information-IC category. Perhaps it is more difficult to achieve uniform interpretations in the wording of objectives involving these categories.

Although the results of this study do not represent a thorough evaluation of the taxonomy, they do provide encouraging support for it. The problem of properly categorizing objectives and determining their distribution across the taxonomy, does not appear as great as identifying them and writing them in the proper form. When objectives are written in the appropriate terms, teachers with only a few hours of exposure to the objectives and the taxonomy could categorize them almost as well as members of the research staff who helped in the development of the taxonomy. Classifications in particular dimensions and categories appear to be easier for some judges, but these differences seem to be largely related to the choice of words and their use in expressing the objectives. The educational content areas, at least the extent of their coverage here, were not important determinants in classification by judges with different professional backgrounds.

APPENDIX G

Sample Interview Form

Th Ha During the past unit, was it an objective to have students receive knowledge and training in handling the carburetor, tools, or other parts in the shop? By this we mean acquiring the knowledge, skills, or attitudes related to identify tools, choosing the proper tools to work on the carburetor, cleaning and caring for the tools, storing tools properly and in the right place.

- e.g., placing tools on the peg correctly, carrying and handling tools, parts, etc., to avoid injury or damage

____In. Was it an objective for students to obtain and retain certain information about the handling of tools, parts, materials, etc., independent of their skills and abilities involved in performing these activities or their attitudes concerning the handling of things? This acquired information could be indicated through oral or written questions, notebooks, or class discussions.

____Sk. Independent of the information or attitudes involved in the handling activities, was it an objective for students to acquire and display some degree of skill, dexterity or ability in performing these simple functions around the shop?

- e.g., dexterity in carrying things to avoid injury or damage, cleaning a part quickly and safely

____At. As a product of the past unit, were students expected to show favorable attitudes and feelings toward these simple actions such as storing materials carefully, expressing to others the importance of carrying things in the proper way?

Th Op In the past unit, was it an objective to have students acquire knowledge, skills, or attitudes related to the following activities: operating and using tools, machines, or equipment to make repairs (e.g. repair a carburetor; assembling or disassembling parts of the fuel system; or, removing and replacing worn parts on the fuel system?

____In. Was it an objective for students to indicate their acquired knowledge or information about these activities through oral or written questions, notebooks, or class discussions? This retained information is independent of their skills and abilities to perform these activities, or their attitudes concerning the operating functions.

- e.g., you may want a student to know how to operate a machine, but not pay attention to the degree of skill

____Sk. Regardless of the information or attitudes concerning the fuel system, was it an objective for students to acquire and display some degree of skill and ability in using tools and equipment in the shop?

- e.g., quickly and skillfully overhaul a fuel pump

____At. As a result of the past unit, were students expected to develop favorable attitudes and feelings about assembling-disassembling parts, repairing them, replacing parts, etc? How does the student indicate that he has developed the proper attitudes?

Th An During the past unit, was it an objective to have students receive knowledge and training in analyzing concrete objects in the shop? By this we mean acquiring the knowledge, skills, or attitudes related to: examining, diagnosing, picking apart, or analyzing any concrete object for the purpose of determing the relationship of one part to another (e.g., determine the relationship of a gear to a cam)? Another analyzing activity may be locating and troubleshooting any malfunctions or problems which may occur in an engine (e.g., troubleshoot a fuel problem)?

____In. Was it an objective for students to obtain knowledge about analyzing fuel systems or troubleshooting malfunctions? Was the student expected to answer questions, participate in class discussions, or give some kind of account to let you know he had retained this information?

- e.g., student would be able to explain how to go about troubleshooting a malfunctioning

____Sk. Was it an objective for students to acquire some degree of skill and ability in performing analytical activities?

- e.g., students are able to locate two malfunctions in a carburetor quickly and accurately

____At. Was it an objective of the past unit to cultivate in the student favorable attitudes toward analyzing, testing, or troubleshooting?

- e.g., student expresses his satisfaction in troubleshooting a problem in the engine correctly

Th In Was it an objective during the past unit to provide students with the knowledge, skills, or attitudes necessary to enable them to invent, design, or create some new or original product?

- e.g., invent something patentable, which would be more efficient in performing the functions of a carburetor

____In. What kind of indices or measures do you use to indicate that the student has obtained and retained information about inventing, designing, or creating? We are interested only in the knowledge that the student has acquired regardless of his skill in performing these functions or his attitude toward them.

____Sk. Was it an objective for students to demonstrate skills and abilities in being able to invent, design, or create new and original products, independent of the information or attitudes involved in this activity?

____At. Was the development of favorable attitudes and feelings of the students toward the inventing activities an objective of this past unit?

Da
St/Re During the last unit, was it an objective to have students acquire the knowledge, skills, or attitudes related to the following: learning definitions of terms, names of processes; learning to read meters; remembering historical events, rules, procedures, formulas, ratios, standards, or prices which may be related to the automotive vocation?

____In. Independent of their skills, attitudes or use, was it an objective for students to remember rules, events, procedures, standards, etc.? Was it an objective for the student to know how to copy or record information, for example in filling out a work order with given information? Was it an objective for them to know how to read instruments?
- e.g., what is the Venturi Principle? What does SAE 30 mean?

____Sk. Was it an objective for students to acquire and display certain skills and proficiencies in learning new terms, recording data, remembering events or formulas, or copying materials given in class?
- e.g., student can quickly and accurately read a voltmeter, record sales receipts, memorize a price list of carburetor parts, identify symbols (This skill is independent of the student's acquired knowledge and his attitudes toward it.)

____At. Was it an objective for students to acquire favorable feelings, attitudes, respect, etc., toward these activities?
- e.g., student expresses the importance of remembering standard codes or parts, or of accurate readings of meters

Da Ma During the past unit, was it an objective to have students receive knowledge and training in using data? By this we mean acquiring the knowledge, skills, or attitudes which would enable the student to do at least one of the following: use symbols and signs, as in making schematics; use language to write essays; calculate using formulas; or apply laws, principles of physics, ideas, or concepts.
- e.g., student can calculate miles per gallon, convert decimals to fractions, or use concepts and ideas to explain how fuel systems work

____In. Was it an objective for students to obtain and retain information about using data such as symbols, numbers words, ideas, or concepts? What is an example of this? How does the student indicate his knowledge to you?

____Sk. Was it an objective for students to acquire and display some degree of skill and proficiency in writing, calculating, making drawings, using math or symbols?
- e.g., student is able to quickly and accurately calculate horsepower, total cost of repairs

____At. Was it an objective for students to acquire and display favorable attitudes and feelings toward performing these activities?
- e.g., student expresses some satisfaction in using mathematics

Da An During the past unit, was it an objective to have students acquire knowledge, skills, or attitudes related to analyzing abstracts in tangible phenomena such as statistical data, historical events or experiences, or pick apart, examine closely, or analyze concepts, principles, or ideas?
- e.g., analyze an event in terms of causes and factors of influence, collect and analyze data on an experiment conducted in the shop

____In. Regardless of the students' actual performances and their attitudes concerning analyzing activities, was it an objective for students to have knowledge of analyzing concepts, principles, or ideas, and demonstrate it by answering test questions or responding orally in class?
- e.g., student can provide a plan to test out an idea and show how data would be analyzed to determine the results of this idea

____Sk. Was it an objective to have students acquire some degree of skill and proficiency in actually performing analyses?
- e.g., student is able to collect data, analyze it, and interpret the results (This skill is independent of the students' acquired information or his attitude.)

____At. Was the development of a favorable attitude toward analytical activities an objective of the past unit?
- e.g., student shows interest and excitement in analyzing concepts or ideas correctly

Da Sy Was it an objective of the past unit to have students acquire knowledge, skills, or attitudes related to formulating industrial policies, or developing theories, laws, axioms, or principles; bringing together the knowledge and information of a general synthesis?

____In. Was it an objective for students to obtain and retain certain information about developing or formulating new theories, generalizations, or principles? This acquired information could be indicated through oral or written questions, notebooks, or class discussions, and does not include the student's skill or attitudes concerning these activities.

____Sk. Independent of the information and attitudes involved in the synthesizing activities, was it an objective for students to acquire and display some degree of skill and ability in formulating new theories, laws, axioms, etc.?
- e.g., student has knack for developing new principles about internal combustion engines

____At. As a product of the past unit, were students expected to show interested attitudes toward synthesizing?
- e.g., student enjoys figuring out new laws

Pe Se In the past unit, was it an objective to have students acquire the knowledge, skill, or attitude related to the social conventions and etiquette in dealing with people as a subordinate?
- e.g., the proper way and the common courtesies extended when dealing with superiors while serving them, carrying out their orders, taking instruction, assisting them, or otherwise acting in a subordinate capacity

____In. Was it an objective for students to indicate their acquired knowledge of conventions, etiquette, and courtesies of subordinates through quizzes, notebooks, class discussions, or other means, other than performance and attitude?
- e.g., student can explain the proper technique and ways of dealing with superiors while assisting, serving, or carrying out orders.

____Sk. Was it an objective for students to show increases in their interpersonal skills and abilities in dealing with superiors? What kind of thing do you look for as an indicator?

____At. Was it an objective for students to develop an appreciation of proper subordinate behaviors in carrying out orders, serving, assisting, or complying with instructors?
- e.g., the student acknowledges the importance of being punctual

Pe In Was it an objective during the past unit to have students acquire knowledge, skills, or attitudes related to interacting in various situations with peers who may be considered as the general public, fellow students, or workers? These situations may occur in such activities as passing information between one another, discussing things, instructing peers on some activity or cooperating in the use of equipment.

____In. Was it an objective for students to answer test questions, keep notebooks, hold class discussions, to indicate their acquired knowledge of social amenities and courtesies while dealing with peers, fellow workers, or the general public?
- e.g., student is able to list the techniques one follows in dealing with a store clerk or customer (This information does not include the students' ability to perform in this capacity or their attitudes concerning the interacting activities.)

____Sk. Was it an objective for students to acquire and display social skills and techniques in dealing with peers, fellow workers, or the general public through actual or role playing situations?
- e.g., students show smoothness in their interpersonal relations in class

____At. Was it an objective to develop feelings and attitudes toward good interpersonal relations, appreciation of the importance of good relations, and confidence in dealing with peers?

Pe Su During the past unit, was it an objective for students to learn supervisory functions? What arrangements do you have for students?

____In. Are students expected to have some knowledge of interpersonal relations regardless of how skillful they may be or how they feel about it?
- e.g., do you have test questions concerning interpersonal relations

____Sk. Was it an objective for students to develop and display supervisory skills and abilities in directing or overseeing work?
- e.g., student displays decorum in making a work assignment

____At. As a product of the past unit, was it an objective for students to realize the importance of sound human relations, techniques in supervisory activities, or gain some appreciation for the role of supervisor in dealing with people?

Pe Ad In the past unit, was it an objective to provide students with the necessary knowledge, skills, or attitudes related to administration activities such as in formulating personnel policies, negotiating policies, or the general management of people in an industry?
- e.g., develop a retirement plan for the employees

____In. What do you use to verify that the student has obtained and retained information concerning the general management of people in an industry?

____Sk. Was it an objective for students to acquire and display some degree of skill and ability in performing these functions?
- e.g., develop a new policy for the welfare of the employees

____At. Were students expected to show favorable attitudes toward these activities such as knowing the importance of being a good administrator?

Pe Co Was it an objective of the past unit for students to acquire the knowledge, skills, or attitudes related to counseling, therapy, or educating people?
- e.g., the techniques used in counseling people on personal problems or advising them on careers

____In. Regardless of skills or attitudes concerning counseling, was it an objective for students to obtain and retain certain information about counseling, advising, or educating people?
- e.g., student is knowledgeable about the techniques used in counseling (This information could be indicated through oral or written questions, notebooks, or class discussions.)

____Sk. Was it an objective for students to acquire and display skills and abilities in actually counseling people on problems, in giving advice, or treating people as does a school or professional counselor?

____At. Was it an objective for students to show favorable attitudes towards these activities such as knowing how critical proper counseling is?

APPENDIX H

Table 1 Distribution of objectives for successive units of instruction for auto mechanics courses in school A

AUTO I

		Things				Data				People			
Units		Ha	Op	An	In	S/R	Ma	An	Sy	Se	In	Su	A/C
1st	In	✓	✓			✓	✓	✓					
	Sk	✓	✓			✓	✓	✓			✓		
	At	✓	✓			✓	✓	✓			✓		
2nd	In	✓	✓	✓		✓	✓				✓		
	Sk	✓	✓	✓		✓	✓			✓	✓		
	At	✓	✓	✓		✓	✓			✓	✓		
3rd	In	✓	✓	✓		✓	✓			✓	✓		
	Sk	✓	✓	✓		✓	✓			✓	✓		
	At	✓	✓	✓		✓	✓			✓	✓		
4th	In	✓	✓	✓		✓	✓	✓			✓		
	Sk	✓	✓	✓		✓		✓		✓	✓		
	At	✓	✓	✓		✓	✓	✓		✓	✓		
AUTO II													
1st	In	✓	✓			✓	✓	✓		✓		✓	
	Sk	✓	✓			✓	✓	✓		✓	✓	✓	
	At	✓	✓			✓	✓	✓		✓	✓	✓	
2nd	In	✓	✓	✓		✓	✓			✓	✓	✓	
	Sk	✓	✓	✓		✓	✓			✓	✓	✓	
	At	✓	✓	✓		✓	✓			✓	✓	✓	
3rd	In	✓	✓	✓		✓	✓	✓		✓	✓	✓	
	Sk	✓	✓	✓		✓	✓	✓		✓	✓	✓	
	At	✓	✓	✓		✓	✓	✓		✓	✓	✓	
4th	In	✓	✓	✓		✓	✓	✓		✓	✓	✓	
	Sk	✓	✓	✓		✓	✓	✓		✓	✓	✓	
	At	✓	✓	✓		✓	✓	✓		✓	✓	✓	

AUTO TRADE & TECHNOLOGY

		Things				Data				People			
Units		Ha	Op	An	In	S/R	Ma	An	Sy	Se	In	Su	A/C
1st	In	✓	✓	✓		✓	✓			✓	✓	✓	
	Sk	✓	✓	✓		✓	✓			✓	✓	✓	
	At	✓	✓	✓		✓	✓			✓	✓	✓	
2nd	In	✓	✓	✓		✓	✓	✓		✓	✓	✓	
	Sk	✓	✓	✓		✓	✓	✓		✓	✓	✓	
	At	✓	✓	✓		✓	✓	✓		✓	✓	✓	
3rd	In	✓	✓	✓		✓	✓	✓		✓	✓	✓	
	Sk	✓	✓	✓		✓	✓	✓		✓	✓	✓	
	At	✓	✓	✓		✓	✓	✓		✓	✓	✓	
4th	In	✓	✓	✓		✓	✓	✓		✓	✓	✓	
	Sk	✓	✓	✓		✓	✓	✓		✓	✓	✓	
	At	✓	✓	✓		✓	✓	✓		✓	✓	✓	

Table 2 Distribution of objectives for successive units of instruction for auto mechanics courses in school B

AUTO I

		Things				Data				People			
Units		Ha	Op	An	In	S/R	Ma	An	Sy	Se	In	Su	A/C
	In	✓	✓	✓		✓				✓	✓	✓	
1st	Sk	✓	✓	✓		✓				✓	✓	✓	
	At	✓	✓	✓		✓				✓	✓	✓	
	In	✓	✓	✓		✓	✓			✓	✓	✓	
2nd	Sk	✓	✓	✓		✓	✓			✓	✓	✓	
	At	✓	✓	✓		✓	✓			✓	✓	✓	
	In	✓	✓			✓	✓						
3rd	Sk	✓	✓			✓	✓			✓	✓	✓	
	At	✓	✓			✓	✓			✓	✓	✓	

AUTO II

		Things				Data				People			
Units		Ha	Op	An	In	S/R	Ma	An	Sy	Se	In	Su	A/C
	In	✓	✓	✓		✓	✓			✓	✓	✓	
1st	Sk	✓	✓			✓	✓			✓	✓	✓	
	At	✓	✓	✓		✓				✓	✓	✓	
	In	✓	✓	✓		✓	✓			✓	✓	✓	
2nd	Sk	✓	✓	✓		✓	✓			✓	✓	✓	
	At	✓	✓	✓		✓	✓			✓	✓	✓	
	In	✓	✓	✓		✓	✓	✓		✓	✓	✓	
3rd	Sk	✓	✓	✓		✓	✓	✓		✓	✓	✓	
	At	✓	✓	✓		✓	✓	✓		✓	✓	✓	

Table 3 Distribution of objectives for successive units of instruction for bookkeeping courses in school A

BOOKKEEPING I

		Things				Data				People			
Units		Ha	Op	An	In	S/R	Ma	An	Sy	Se	In	Su	A/C
	In	✓				✓	✓	✓		✓	✓		
1st	Sk	✓	✓			✓	✓	✓			✓	✓	
	At	✓	✓			✓	✓	✓		✓	✓	✓	
	In	✓				✓	✓	✓		✓	✓		
2nd	Sk	✓	✓			✓	✓	✓		✓	✓		
	At	✓	✓			✓	✓	✓		✓	✓		
	In	✓	✓			✓	✓	✓		✓			
3rd	Sk	✓				✓	✓	✓		✓	✓	✓	
	At	✓	✓			✓	✓	✓		✓	✓	✓	

BOOKKEEPING II

		Things				Data				People			
Units		Ha	Op	An	In	S/R	Ma	An	Sy	Se	In	Su	A/C
	In	✓	✓			✓	✓	✓		✓			
1st	Sk	✓	✓			✓	✓			✓	✓		
	At	✓	✓			✓	✓	✓		✓	✓		
	In					✓	✓	✓					
2nd	Sk	✓	✓			✓	✓	✓		✓	✓		
	At	✓	✓			✓	✓	✓		✓	✓		
	In	✓	✓			✓	✓	✓					
3rd	Sk	✓	✓			✓	✓	✓			✓	✓	
	At	✓	✓			✓	✓	✓			✓	✓	

Table 4 Distribution of objectives for successive units of instruction for drafting courses in school A

ELECTRONIC DRAFTING

		Things				Data				People			
Units		Ha	Op	An	In	S/R	Ma	An	Sy	Se	In	Su	A/C
1st	In	✓				✓	✓				✓		
	Sk	✓				✓	✓				✓		
	At	✓				✓	✓				✓		
2nd	In	✓	✓			✓		✓		✓			
	Sk	✓	✓			✓		✓		✓	✓		
	At	✓	✓			✓		✓		✓	✓		
3rd	In	✓	✓	✓		✓	✓	✓					
	Sk	✓	✓	✓		✓		✓					
	At	✓	✓	✓		✓	✓	✓					

DRAFTING I

		Things				Data				People			
Units		Ha	Op	An	In	S/R	Ma	An	Sy	Se	In	Su	A/C
1st	In	✓	✓				✓	✓			✓		
	Sk	✓	✓			✓	✓	✓					
	At	✓	✓			✓	✓	✓			✓		
2nd	In			✓		✓	✓			✓			
	Sk		✓	✓		✓	✓	✓		✓	✓		
	At		✓	✓		✓	✓	✓		✓	✓		
3rd	In	✓	✓	✓	✓	✓	✓	✓		✓			
	Sk	✓	✓	✓	✓	✓	✓	✓		✓			
	At	✓	✓	✓	✓	✓	✓	✓			✓		

DRAFTING II

		Things				Data				People			
Units		Ha	Op	An	In	S/R	Ma	An	Sy	Se	In	Su	A/C
1st	In	✓	✓	✓			✓	✓					
	Sk	✓	✓	✓			✓	✓		✓			
	At	✓	✓	✓			✓	✓			✓		
2nd	In		✓	✓		✓	✓	✓		✓		✓	
	Sk	✓	✓	✓		✓	✓	✓		✓	✓	✓	
	At	✓	✓	✓		✓	✓	✓		✓	✓	✓	
3rd	In	✓		✓	✓	✓	✓	✓			✓		
	Sk	✓	✓	✓		✓	✓	✓					
	At	✓	✓	✓	✓	✓	✓	✓			✓		

DRAFTING III

Units		Things				Data				People			
		Ha	Op	An	In	S/R	Ma	An	Sy	Se	In	Su	A/C
	In					✓	✓						
1st	Sk		✓			✓	✓	✓		✓	✓		
	At		✓			✓	✓	✓		✓			
	In					✓	✓	✓					
2nd	Sk		✓			✓	✓	✓		✓	✓		
	At					✓	✓	✓		✓	✓		
	In	✓		✓		✓	✓	✓					
3rd	Sk	✓	✓	✓		✓	✓	✓					
	At	✓	✓	✓		✓	✓	✓					

DRAFTING IV

	In			✓									
1st	Sk			✓			✓	✓					
	At			✓			✓	✓					
	In		✓	✓		✓	✓	✓		✓			
2nd	Sk	✓	✓	✓		✓	✓	✓		✓	✓		
	At	✓	✓	✓		✓	✓	✓		✓	✓		
	In			✓		✓	✓						
3rd	Sk	✓	✓	✓		✓	✓	✓					
	At	✓	✓	✓		✓	✓	✓					

Table 5 Distribution of objectives for successive units of instruction for drafting courses in school B

DRAFTING I

		Things				Data				People			
Units		Ha	Op	An	In	S/R	Ma	An	Sy	Se	In	Su	A/C
1st	In	✓	✓	✓		✓	✓	✓					
	Sk	✓	✓	✓		✓	✓	✓			✓		
	At	✓	✓	✓		✓	✓	✓			✓		
2nd	In		✓	✓	✓	✓	✓	✓		✓			
	Sk	✓	✓	✓	✓	✓	✓	✓		✓	✓		
	At	✓	✓	✓	✓	✓	✓	✓		✓	✓		
3rd	In	✓	✓			✓	✓	✓					
	Sk	✓	✓			✓	✓	✓			✓		
	At	✓	✓			✓	✓	✓			✓		
DRAFTING II													
1st	In	✓	✓			✓	✓	✓					
	Sk	✓	✓			✓	✓	✓			✓		
	At	✓	✓			✓	✓	✓			✓		
2nd	In			✓	✓	✓	✓	✓		✓			
	Sk	✓	✓	✓	✓	✓	✓	✓		✓	✓		
	At	✓	✓	✓	✓	✓	✓	✓		✓	✓		
3rd	In	✓	✓	✓		✓	✓	✓		✓			
	Sk	✓	✓	✓		✓	✓	✓		✓	✓		
	At	✓	✓	✓		✓	✓	✓		✓	✓		
DRAFTING III													
1st	In		✓	✓	✓	✓	✓	✓					
	Sk	✓	✓	✓	✓	✓	✓	✓			✓		
	At	✓	✓	✓	✓	✓	✓	✓			✓	✓	
2nd	In	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	
	Sk	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	
	At	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	
3rd	In		✓	✓	✓	✓	✓	✓		✓	✓	✓	
	Sk	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	
	At	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	

DRAFTING IV

		Things				Data				People			
Units		Ha	Op	An	In	S/R	Ma	An	Sy	Se	In	Su	A/C
1st	In	✓	✓			✓	✓	✓					
	Sk	✓	✓	✓		✓	✓	✓			✓		
	At	✓	✓	✓		✓	✓	✓			✓		
2nd	In	✓		✓	✓	✓	✓	✓		✓		✓	
	Sk	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	
	At	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	
3rd	In	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	
	Sk	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	
	At	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	

Table 6 Distribution of objectives for successive units of instruction for electronics courses in school A

ELECTRONICS I

		Things				Data				People			
Units		Ha	Op	An	In	S/R	Ma	An	Sy	Se	In	Su	A/C
1st	In	✓	✓	✓		✓	✓			✓	✓		
	Sk	✓	✓	✓		✓	✓			✓	✓	✓	
	At	✓	✓	✓		✓	✓			✓	✓	✓	
2nd	In	✓	✓			✓	✓						
	Sk	✓	✓			✓	✓			✓	✓	✓	
	At	✓	✓			✓	✓			✓	✓	✓	
3rd	In	✓	✓	✓		✓	✓						
	Sk	✓	✓	✓		✓	✓			✓	✓	✓	
	At	✓	✓	✓		✓	✓			✓	✓	✓	
4th	In	✓	✓	✓		✓	✓	✓					
	Sk	✓	✓	✓		✓	✓	✓		✓	✓	✓	
	At	✓	✓	✓		✓	✓	✓		✓	✓	✓	

ELECTRONICS II

		Things				Data				People			
Units		Ha	Op	An	In	S/R	Ma	An	Sy	Se	In	Su	A/C
1st	In	✓	✓	✓	✓	✓	✓			✓	✓		
	Sk	✓	✓	✓	✓	✓	✓			✓	✓	✓	
	At	✓	✓	✓	✓	✓	✓			✓	✓	✓	
2nd	In	✓	✓			✓	✓	✓					
	Sk	✓	✓			✓	✓	✓		✓	✓	✓	
	At	✓	✓			✓	✓	✓		✓	✓	✓	
3rd	In	✓	✓	✓		✓	✓	✓			✓		
	Sk	✓	✓	✓		✓	✓	✓		✓	✓	✓	
	At	✓	✓	✓		✓	✓	✓		✓	✓	✓	
4th	In	✓	✓	✓		✓	✓	✓					
	Sk	✓	✓	✓		✓	✓	✓		✓	✓	✓	
	At	✓	✓	✓		✓	✓	✓		✓	✓	✓	

TRADE & TECHNICAL ELECTRONICS

		Things				Data				People			
Units		Ha	Op	An	In	S/R	Ma	An	Sy	Se	In	Su	A/C
1st	In	✓	✓	✓	✓	✓	✓	✓				✓	
	Sk	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	
	At	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	
2nd	In	✓	✓	✓		✓	✓	✓					
	Sk	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	
	At	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	
3rd	In	✓	✓	✓		✓	✓	✓					
	Sk	✓	✓	✓		✓	✓	✓		✓	✓	✓	
	At	✓	✓	✓		✓	✓	✓		✓	✓	✓	
4th	In	✓	✓	✓		✓	✓	✓					
	Sk	✓	✓	✓		✓	✓	✓		✓	✓	✓	
	At	✓	✓	✓		✓	✓	✓		✓	✓	✓	

Table 7 Distribution of objectives for successive units of instruction for electronic courses in school B

ELECTRONICS I

		Things				Data				People			
Units		Ha	Op	An	In	S/R	Ma	An	Sy	Se	In	Su	A/C
1st	In		✓			✓	✓						
	Sk	✓	✓				✓			✓	✓	✓	
	At	✓	✓			✓	✓			✓	✓	✓	
2nd	In	✓	✓			✓	✓						
	Sk	✓	✓			✓	✓			✓	✓	✓	
	At	✓	✓			✓	✓			✓	✓		
3rd	In	✓	✓			✓				✓			
	Sk	✓	✓			✓	✓			✓	✓		
	At	✓	✓			✓	✓			✓	✓		
4th	In		✓			✓	✓			✓	✓		
	Sk	✓	✓			✓	✓				✓		
	At	✓	✓			✓	✓			✓	✓		

ELECTRONICS II

		Things				Data				People			
Units		Ha	Op	An	In	S/R	Ma	An	Sy	Se	In	Su	A/C
1st	In	✓	✓	✓		✓	✓						
	Sk	✓	✓	✓		✓	✓	✓				✓	
	At	✓	✓	✓		✓	✓	✓				✓	
2nd	In		✓			✓	✓						
	Sk	✓	✓			✓	✓			✓	✓		
	At	✓	✓			✓	✓			✓	✓		
3rd	In					✓	✓						
	Sk		✓			✓	✓						
	At		✓			✓	✓						

Table 8 Distribution of objectives for successive units of instruction for machine shop courses in school A.

MACHINE SHOP I

		Things				Data				People			
Units		Ha	Op	An	In	S/R	Ma	An	Sy	Se	In	Su	A/C
1st	In	✓	✓			✓	✓				✓		
	Sk	✓	✓			✓	✓				✓		
	At	✓	✓			✓	✓				✓		
2nd	In	✓	✓			✓	✓						
	Sk	✓	✓			✓	✓			✓	✓		
	At	✓	✓			✓	✓			✓	✓		
3rd	In	✓	✓		✓	✓							
	Sk	✓	✓	✓	✓	✓	✓				✓		
	At		✓	✓	✓	✓	✓			✓	✓		

MACHINE SHOP II

		Things				Data				People			
Units		Ha	Op	An	In	S/R	Ma	An	Sy	Se	In	Su	A/C
1st	In	✓	✓			✓							
	Sk	✓	✓			✓				✓	✓		
	At	✓	✓			✓				✓	✓		
2nd	In	✓	✓			✓	✓				✓		
	Sk	✓	✓			✓	✓			✓	✓	✓	
	At	✓	✓			✓	✓			✓	✓	✓	
3rd	In	✓	✓			✓							
	Sk	✓	✓			✓	✓				✓		
	At	✓	✓			✓	✓				✓		

TRADE & TECHNICAL MACHINE

		Things				Data				People			
Units		Ha	Op	An	In	S/R	Ma	An	Sy	Se	In	Su	A/C
1st	In	✓	✓			✓	✓						
	Sk	✓	✓	✓		✓	✓			✓	✓		
	At	✓	✓	✓		✓	✓				✓		
2nd	In					✓	✓					✓	
	Sk	✓				✓	✓			✓	✓	✓	
	At	✓				✓	✓			✓	✓	✓	
3rd	In		✓			✓	✓						
	Sk	✓	✓	✓		✓	✓			✓	✓		
	At	✓	✓	✓		✓	✓			✓	✓		

Table 9 Distribution of objectives for successive units of instruction for construction technology and woodwork courses in school A.

CONSTRUCTION TECHNOLOGY

		Things				Data				People			
Units		Ha	Op	An	In	S/R	Ma	An	Sy	Se	In	Su	A/C
1st	In	✓	✓	✓		✓				✓	✓	✓	
	Sk	✓		✓						✓	✓		
	At	✓	✓	✓		✓				✓	✓	✓	
2nd	In	✓	✓	✓		✓	✓			✓		✓	
	Sk	✓	✓	✓		✓	✓			✓	✓	✓	
	At	✓	✓	✓		✓	✓				✓	✓	
3rd	In		✓				✓				✓		
	Sk	✓	✓				✓			✓	✓	✓	
	At	✓	✓				✓			✓	✓	✓	
4th	In	✓	✓	✓		✓	✓			✓	✓	✓	
	Sk	✓	✓	✓		✓	✓			✓	✓	✓	
	At	✓	✓	✓		✓	✓			✓	✓	✓	

WOODSHOP I

		Things				Data				People			
Units		Ha	Op	An	In	S/R	Ma	An	Sy	Se	In	Su	A/C
1st	In	✓	✓	✓		✓							
	Sk	✓	✓	✓		✓					✓		
	At	✓	✓	✓		✓					✓		
2nd	In	✓		✓		✓	✓					✓	
	Sk	✓	✓	✓		✓	✓			✓	✓	✓	
	At	✓	✓	✓		✓	✓			✓	✓	✓	
3rd	In	✓	✓	✓		✓	✓			✓	✓	✓	
	Sk	✓	✓	✓		✓	✓			✓	✓	✓	
	At	✓	✓	✓		✓	✓			✓	✓	✓	

WOODSHOP II

		Things				Data				People			
Units		Ha	Op	An	In	S/R	Ma	An	Sy	Se	In	Su	A/C
1st	In	✓	✓	✓		✓		✓				✓	
	Sk	✓	✓			✓		✓			✓	✓	
	At	✓	✓	✓		✓		✓			✓	✓	
2nd	In	✓	✓	✓	✓	✓	✓						
	Sk	✓	✓	✓	✓	✓	✓				✓		
	At	✓	✓	✓	✓	✓	✓				✓		
3rd	In	✓	✓	✓		✓	✓			✓	✓	✓	
	Sk	✓	✓	✓		✓	✓			✓	✓	✓	
	At	✓	✓	✓		✓	✓			✓	✓	✓	

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RETRIEVAL TERMS

Vocational-industrial course objectives

Taxonomy of education objectives

IDENTIFIERS

ABSTRACT

A basic taxonomy of educational objectives has been constructed in the form of a matrix of: (1) three Activity Areas, (2) four Levels of Functioning, and (3) three categories of Individual Characteristics. This matrix forms a 36-category classification system. The objective was to develop a taxonomy of vocational-industrial education objectives that would (a) provide a framework for evaluating and comparing existing programs, and (b) use the taxonomy to eventually establish criteria for the design and development of a radically different comprehensive curriculum.

Research was conducted to demonstrate that the taxonomy can be used profitably to describe, measure, and compare the vocationl-industrial education curricula of two high schools. Twenty-six vocational education courses representing six general areas in two selected schools were studied by interviews with the instructors. These interviews were conducted periodically throughout the school year.

The data collected revealed relatively few differences in the patterns of objectives across interviews, courses, and schools.